THIS IS OUR SOIL

To the Boys and Girls of America:

Did you ever stop to think how much soil means to you? From the soil came the food you ate today, the clothes you are wearing, the wood to build the house you live in or the school you attend. The grass and flowers you enjoy at home or in the parks grow in soil. Most of the balls, bats, and racquets you play with were made from plants which grew in the soil. Without soil you could have none of these things.

Because what you are and what you do depend so much on the soil we have written this booklet, "This Is Our Soil," for you to read and study. We have tried to tell you what soil is and how it has been and is being damaged. We have also pointed out the methods that can be used, and that many farmers are using, to care for the soil so that it will produce the things you need for years to come.

You boys and girls are the future citizens of this country, and are entitled to know about our most important resource, the soil. We hope this booklet will start you on the road to becoming good soil conservationists.

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THIS IS OUR SOIL

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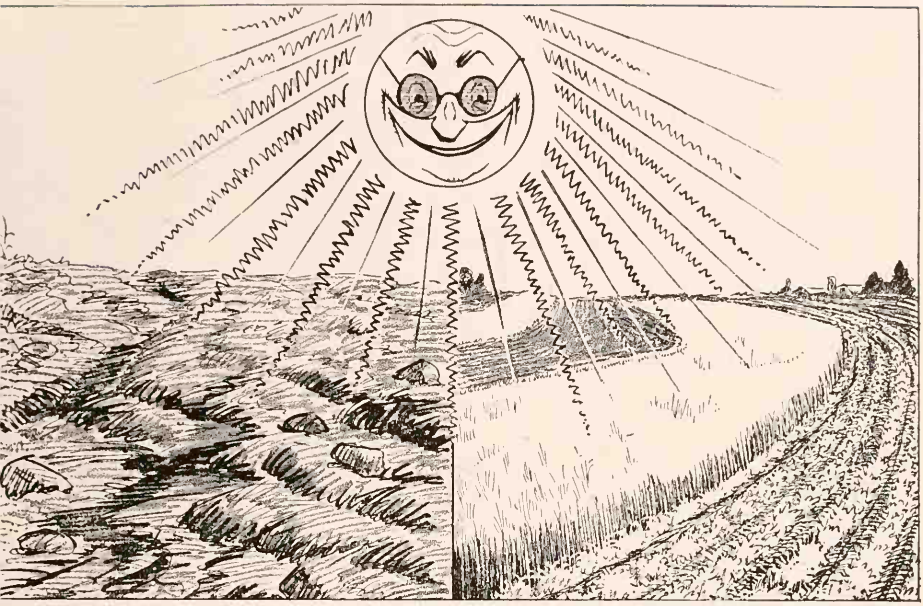
It takes plenty of the right kinds of food for the pep to work and play and to enjoy life. In the following pages you will see how soil is needed to produce this food.



Barren Field

Fertile Field

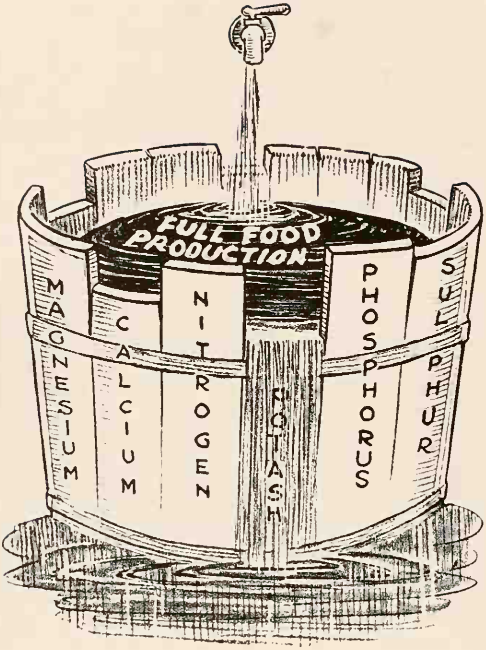
THE SUN MAKES US GO

DO YOU EVER WONDER where you get your energy to play and work? The energy you have and the heat in your body that keeps you warm come from the sun.

But you do not get your energy directly from the sun. It comes to you through the food you eat. Vegetables have to have the sun shine on them to make them grow. They store up the sun's energy in their leaves, stems, roots, and seeds. Then you eat the vegetables to make *you* grow. Animals eat vegetables and plants, too. They use the energy they get from the plants to make meat, milk, or eggs. When you eat any of these things, you get energy from them, too.

So the food you eat is largely the sun's energy. It is bundled up for you in the plants, along with nitrogen and minerals that the plants get from the soil. This food gives you strength to play, work, and think.

Plants grow in soil but the better the soil the better they grow. The sun shines just as brightly on a barren field as it does on a fertile one, but the good soil can use much more of the energy it gets from the sun to produce the food you eat.



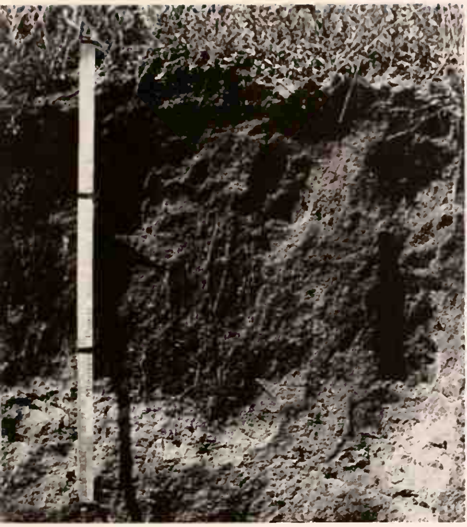
Growing a crop on soil low in one or more minerals is like trying to fill a barrel with water when one of the staves is too short. You cannot fill the barrel above the short stave because the water will spill out. In the same way, if a plant has too little of any mineral that it needs, it will not grow as well as it should.

THE SOIL—OUR FOOD FACTORY

YOU HAVE SEEN THINGS made of iron. Iron is a mineral; so are calcium and phosphorus. The soil contains small amounts of different minerals. Besides getting energy from the sun, the plants we use for food get minerals from the soil. You get some of the minerals when you eat the food. Different minerals help to give you good teeth, strong bones, and a strong, healthy body. If the soil doesn't have enough of the minerals that plants need, the plants can't grow strong and healthy. The people and animals that eat the plants can't grow strong and healthy either.

As crops grow, they use some of the minerals from the soil to keep them healthy. The rain also washes some of the minerals out of the soil. When the soil needs more minerals the farmer can add them by putting on fertilizer. He can help to save the minerals already in the soil if he feeds the crops to livestock and puts the manure back on the soil, or if he plows back into the land the leaves, stems, and other crop remains.

Doing all these things is simply good business for the farmer. It means that he will have bigger crops, better feeds, and more profit.



Deep Topsoil

Shallow Topsoil

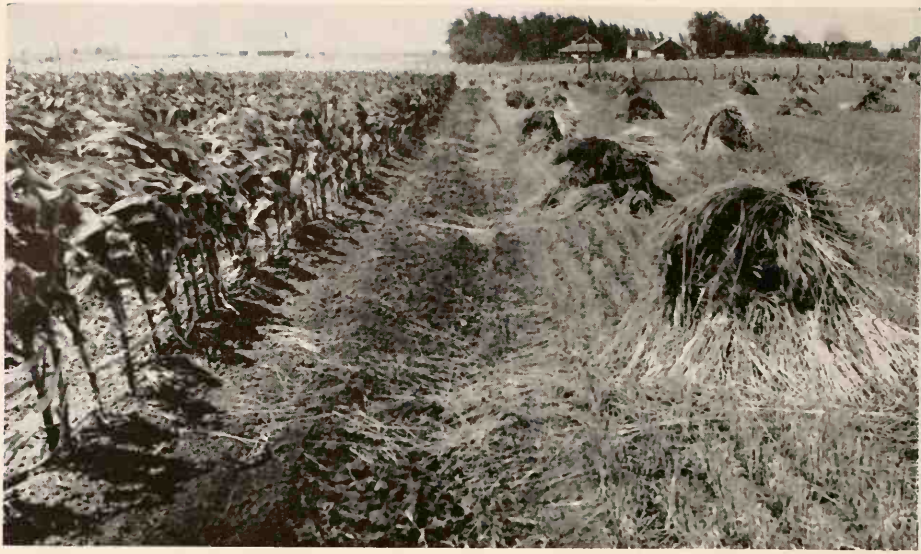
DEEP TOPSOILS GROW THE MOST FOOD

THE TOPSOIL is the upper layer of the soil that is often darker colored than the lower layers. It is only a few inches deep, but these few inches are very important to us.

Topsoil has the food the plant needs, ready for use. The soil below the topsoil has some of these foods, too, but they are tied up in pieces of rock, sand, and clay and the plants cannot get them so easily.

The topsoil contains the decayed leaves, stems, and roots of plants that have grown on the land. These generally give the topsoil a dark color and help make it rich. Tiny living plants and animals which live in the topsoil cause the decay of the dead leaves and other parts of the plants. Many of these tiny organisms are too small for you to see without a microscope. Yet their work helps to enrich the soil.

You would expect the deep topsoils to be better than shallow ones, wouldn't you? That is exactly right. The deeper topsoil has more food for the plants. Farmers who have deep topsoil can grow bigger crops than they could if their topsoil were shallow or if they had no topsoil at all. Illinois topsoil that was 10 inches deep produced 60 bushels of corn an acre. But where the topsoil was only 5 inches deep, the yield was only 40 bushels. And of course the more bushels farmers can grow, the more food there will be for people and animals to eat.



WE NEED GOOD LAND TO GROW PLENTY OF FOOD

YOUR FOOD, your clothing, and your shelter all come from the soil. Upon it, to a large extent, depend your present health and comfort and your whole future welfare.

Did you know that it takes two and a half acres of cropland to grow enough food each year just for you yourself to eat? And another half acre is needed to produce the crops from which your clothing is made. This total of three acres is a piece of land about the size of three football fields.

People in other countries do not have so much to eat or so many different kinds of food as we do. The reason is that they do not have so much cropland as we have. For example, Italy has only three quarters of an acre for each person, and China only half an acre.

Here is a picture of good farm land. It is the kind of land that produces big crops. The farmer who owns it is taking good care of it. As long as he does so, it will keep on growing big crops to feed many people like you.

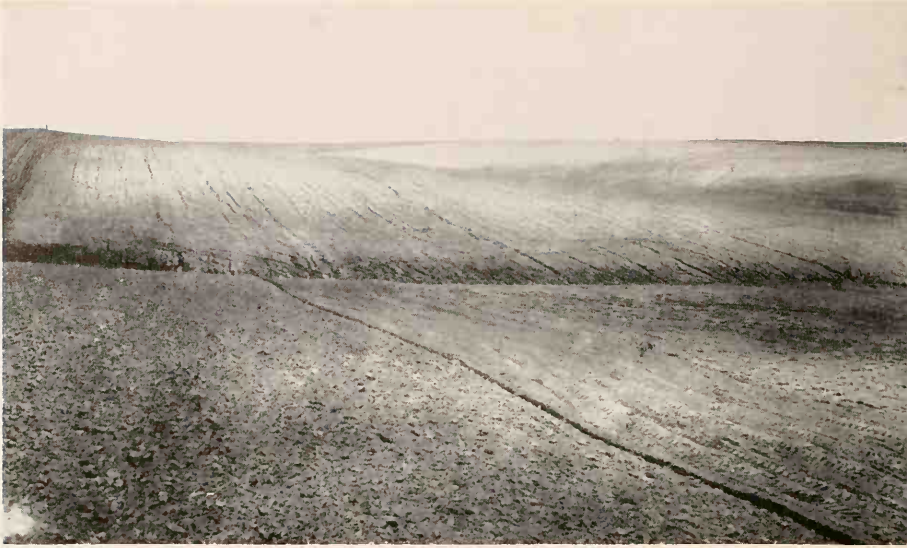
All the land in our country has been explored, and most of it is in use. There is not any more land to be found. Farmers cannot move to new land if their present farms wear out. So you can see how it is important for us to take good care of the land we have.

WATER IS NEEDED FOR LIFE AND GROWTH

A LOT OF CORN, isn't it? Most of this corn will be fed to cows, pigs, and chickens to produce milk, meat, and eggs for you to eat. Some of it will be made into breakfast foods, syrup, and starches.

It takes good soil to produce such large piles of corn. And it also takes a lot of water—50 gallons for each ear, and 5,000 gallons for a bushel. A bushel of wheat needs 4,000 gallons. It takes 80 gallons of water to grow a pound of cotton, 93 gallons for a pound of soybeans, 100 gallons for a pound of hay, and 1,000 gallons for a pound of rayon. To produce one pound of beef requires 1,300 gallons of water. This includes the water needed to grow the feed the animal eats, the water it drinks, and the water used in processing the meat at the packing house. These figures show how much we depend on water for the food we eat and the clothes we wear.

To have big crops, the farmer must be a good manager. He must know how to keep his land fertile and how to save the rain that falls. Also he must use good seed.



SHEET EROSION STEALS TOPSOIL

THIS PICTURE shows how much of our topsoil is being lost. The rain removes a thin layer of soil from the field at a time. This is called sheet erosion. The soil moves away so slowly that the farmer does not notice it until a large amount has been lost.

When the farmer sees a light-colored place showing up in his fields, he knows that the topsoil is about gone there. Before this happens, however, he will probably notice that his crops are getting smaller and smaller. By boring holes in his fields with an auger or digging with a spade, he can see how much topsoil he has left because the soil underneath is lighter. If he compares the topsoil in his fields with some nearby land that has never been plowed, he can find out how much he has lost.

Sheet erosion is the worst kind of erosion caused by water, because the farmer usually does not notice it until a great deal of damage has been done. When the field in this picture was first plowed, it was probably covered with 9 or 10 inches of black or dark brown topsoil. Now this topsoil is nearly all gone.

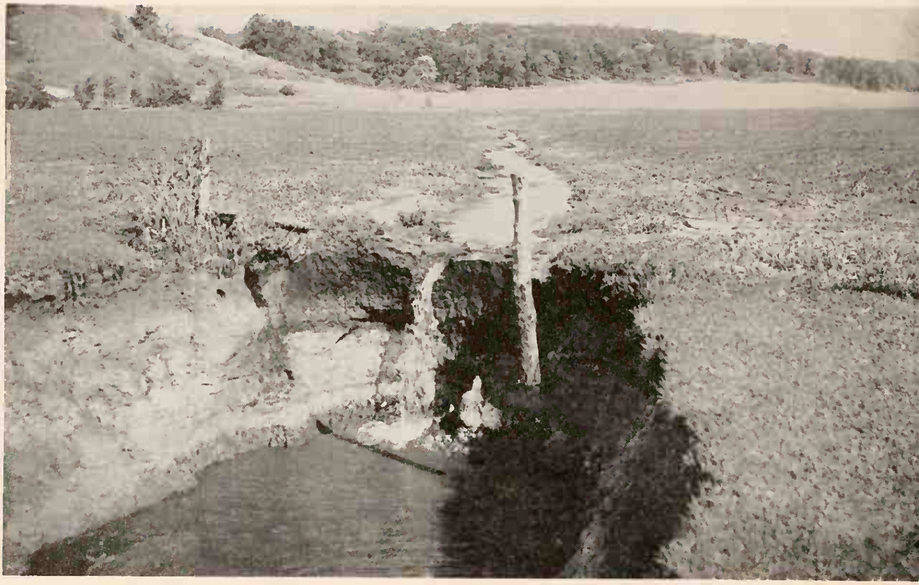
Who is the loser when topsoil washes away? The farmer of course loses, and so do all the rest of us—for we depend on the farmer to help provide us with the things we need in order to live.

HERE IS RUSHING WATER IN ACTION

AFTER A HARD RAIN, haven't you noticed scenes like this one? This is soil erosion as it is actually happening. The field is not very steep, but notice how fast the water is rushing from it. When water collects in large amounts like this and starts to run fast, it is able to cut away and move soil. Notice, too, that the field is bare. Grass or other growing plants would have helped to hold back the water.

No doubt many of you have driven by crop fields after a sudden rain. You have seen the dirty, foamy water rush under the bridge or across the road. The rain had fallen so fast that the soil couldn't soak it all up. The water ran from the fields into the small creeks, and the creeks rushed madly on to the larger streams. These flowed into the rivers and on to the ocean. With them they carried rich topsoil that the rain had washed from the fields. A lot of the plant food that the crops need was stolen from the land by the rushing water.

Hard rains do most of the damage to the soil. Gentle rains do not wash much soil away. This means that the farmer must prepare for the worst storms if he is to win the battle against erosion. He can do it by planting grass crops, by farming his land on the contour, and by building terraces so that the water cannot wash his good soil away.



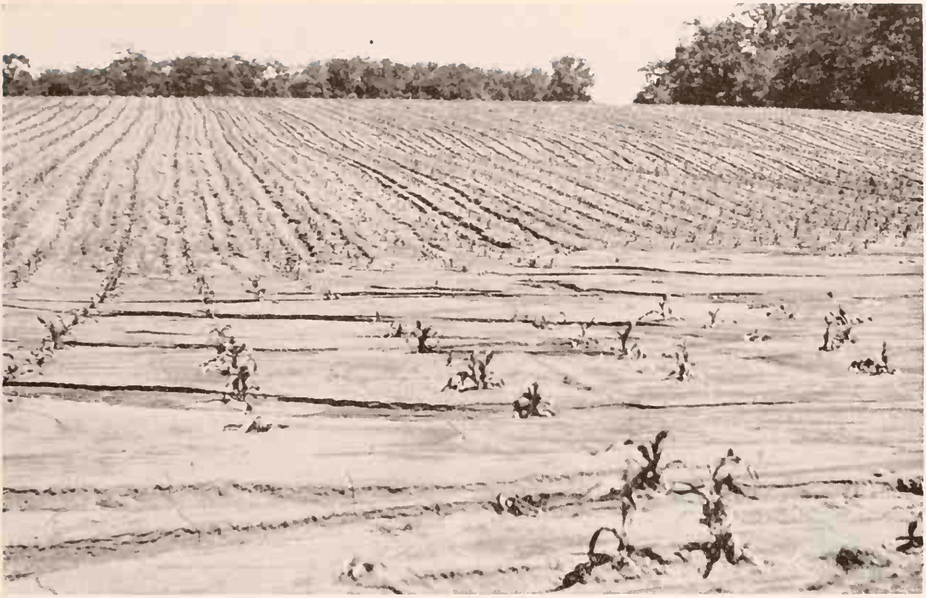
A NEGLECTED GULLY KEEPS GROWING

When rain falls on a field faster than the soil can soak it up, it must run off. The water first collects in low places and runs off in little rivulets. When water collects like this, it starts making a ditch or gulley. Every time it rains, the gully gets deeper. Water spilling into it at the end and over the sides makes a waterfall. These waterfalls cut back farther and farther into the field.

At first the farmer crosses these gullies with his plows and other tools. When they get large, he can no longer cross them but must work around them. This means that much land is wasted that should be growing crops. When gullies get very deep, it is dangerous to work close to them because the sides may cave in. Thus still more land is wasted.

Gullies like this one may run from one farm onto another. They can damage highways and railroads too. Soil from these gullies moves downstream to fill rivers, reservoirs, and drainage ditches. It should be kept in the farmer's field where it is needed and where it will not harm other people.

When gullies are small, they can be stopped rather easily. After they get large and deep like this one, they are hard to control. And it costs a lot of money to fix them. It is best not to let them get started at all. See page 30 for the way to keep gullies from forming.



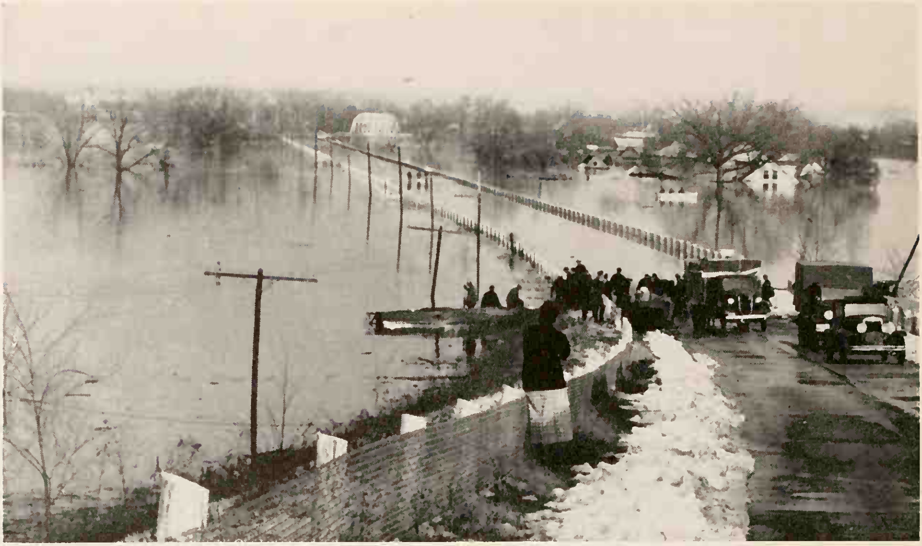
DISPLACED TOPSOIL DOES HARM RATHER THAN GOOD

HERE IS SOIL piled deeply on top of other soil. As soon as running water loaded with soil slows down, it drops part of its load. This may be at the lower part of the farmer's field. Or it may be in a roadside ditch or a culvert or in a water reservoir.

Soil piling up at the lower part of the field covers up plants. Sometimes it buries fences. It would be better to have it spread out evenly over a large area rather than piled up deeply in one place. For a while this good soil makes the lowland better. But after the topsoil has washed from the field, then the poorer soil underneath starts washing down and covers up the good topsoil on the lower land. Soil moving in this way is ruining millions of acres of good lowlands.

But not all the soil stops in the low parts of the field. Some of it is carried on down to the large streams, making them muddy. This muddy water is not good for fish nor is it good for people. Cities have to spend large sums of money to make the water clean and pure so that the people can drink it.

Next time you cross a river, see whether the water is clear or muddy. Muddy water means that some of the farm land is on its way to the ocean. We need to keep it on the farms to grow our food.

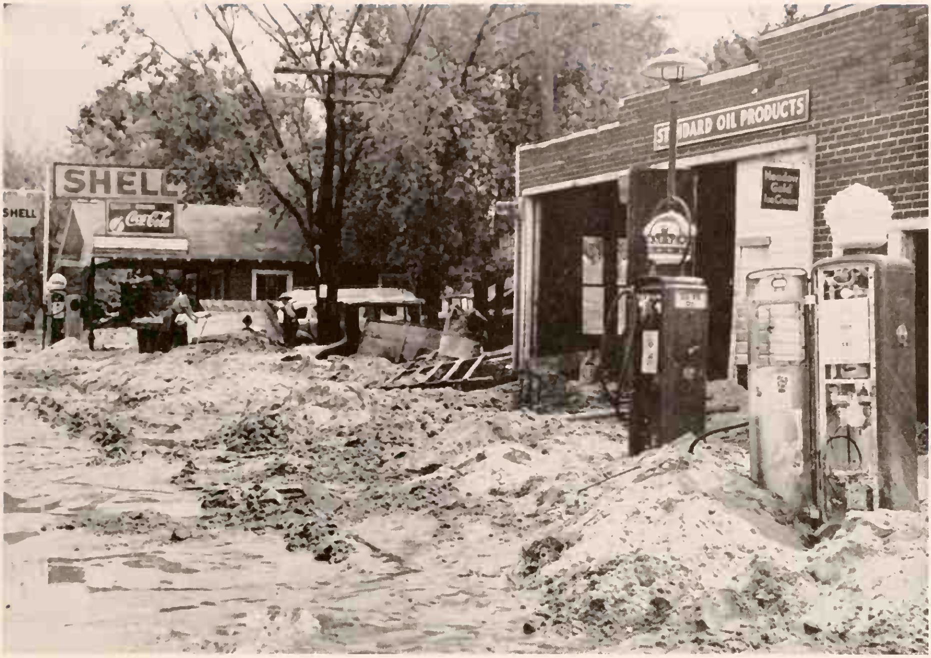


FLOODS DAMAGE PROPERTY AND CARRY AWAY SOIL

THIS RIVER usually follows a narrow channel bordered by trees. Now it covers the entire valley. You can hardly see the bridge or the rooftops of the houses above the water. The stream is flooding the farmland and ruining the growing crops. Many farm animals have been drowned. Rabbits, quail, and other wild animals and birds have lost their homes.

Bad as all this is, it is not the worst damage being done by the flood. The water is carrying great loads of topsoil to the sea. That means that the land cannot produce so much food for us in the future.

There have always been floods, even when the land was covered with trees and grass which helped the soil to soak up the water. Now, however, the floods are much worse than the ones our forefathers saw. So many trees have been cut and so much grass has been plowed under that the water runs off much faster than it did before, and more soil washes away. As the topsoil gets thinner in the farmer's fields, the water runs off still faster. This is because the second layer of soil (the subsoil) cannot soak up and hold as much water as good, rich topsoil can hold. Rushing off the land after a heavy rain, the water fills the rivers so quickly that they cannot hold all of it. The soil carried by the water fills the stream beds too and leaves less room for the water. As more and more water pours into the rivers, they finally spill over their banks and we have a flood.



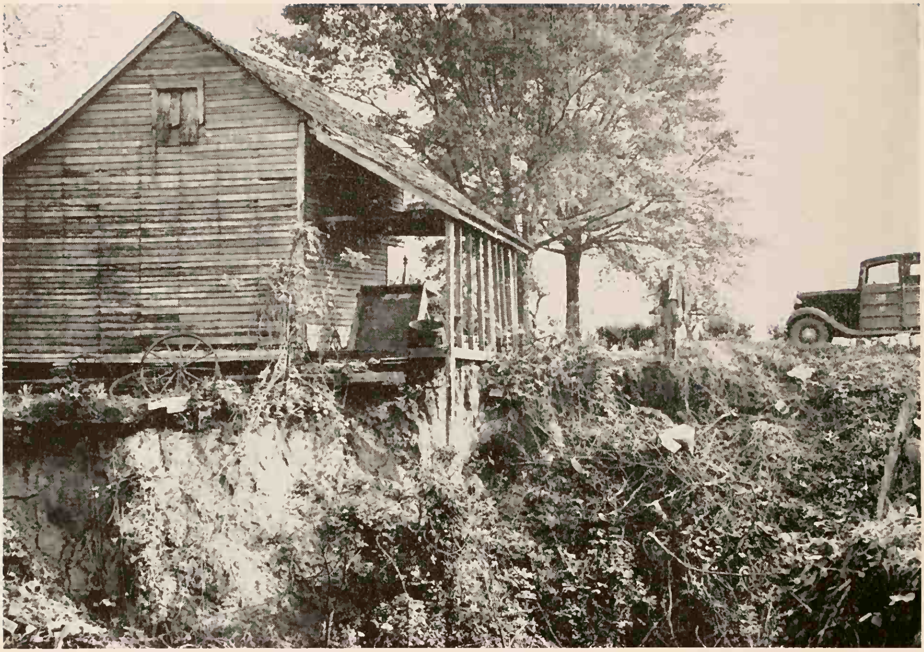
EROSION WRECKS A TOWN

HERE IS WHAT SOIL EROSION can do to things that people build. Sand and loose soil washed down by a single rain nearly ruined this small Illinois town. Many houses and their furnishings were destroyed or severely damaged. A great deal of damage was done to other buildings and property. In some places the highway through the town was covered with several feet of sand. This had to be removed by the use of heavy machinery. All of this cost a great deal of money.

This is just one illustration of the kind of damage that runoff water can do to property. In other places railroads have been washed out, water reservoirs have been filled with washed-in soil, fish have been killed, and sometimes harbors have been filled so full of soil that the ships cannot come in.

Farmers working alone cannot solve problems of this kind. It takes all of the people working together.

Where did the soil come from that did this damage? What can individual farmers do to prevent such damage? What can people do as a group to help the farmers?



EROSION WRECKS A HOME

THIS PICTURE shows how erosion can make people poor and wreck their homes. The farmer's home and his business are very closely related. His home is really part of his business. If his farm does well, he has a good home to live in. If his farm is poor, his home usually is poor too.

In this picture, erosion is actually wrecking a house because the gully has undermined it. But the house shows that the wrecking began long before the gully got so close to it. As his land got poorer and grew smaller crops, the farmer had to neglect his house. He did not paint it or keep it in repair. His income was so small that he had to use it for things he thought were more important, like clothing and food for his family, and at that he didn't have enough money to buy all the things they needed. It was erosion that started all these troubles. So erosion affects not only the farmer but everyone in his family.

Erosion also affects other people. As the farmer's income grows smaller he cannot buy many of the things that the merchants have to sell. More important, if he produces barely enough to feed himself and his family, he will have little left over to help feed people in town.

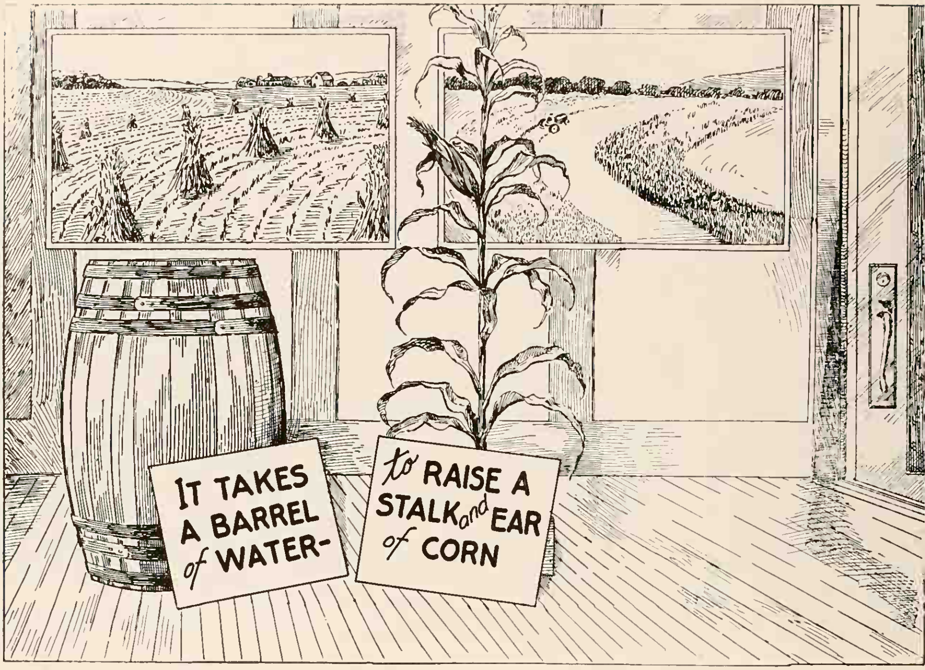
WINDS ALSO CARRY AWAY SOIL

NOT ALL EROSION is caused by water. A lot of soil is blown away by the wind. Wind erosion is most common on the Great Plains, but it also occurs in many other places. Like water erosion, wind erosion does not occur when the land is covered with grass or trees.

You may have heard your parents talk about the black blizzards of the 1930's. For several years rainfall had been lower than usual, leaving the soil dry and powdery. Land had been plowed for wheat and other crops, so that there was no cover of grass to hold the soil in place. Then strong winds came and carried the soil high into the air. They carried away the topsoil, which you know is the best soil. They also picked up poor soil and piled it on top of good soil.

Most of the dust came from poor land, land that should not have been plowed at all. This land should have been kept in grass. Good land which is deep, level, and not too sandy will not blow so badly. But even the good land needs care to prevent damage, especially when there isn't much rain.

Some ways to control wind erosion are wind strip cropping, use of cover crops, and crop rotations. One of the most important is stubble-mulch tillage, described in more detail on page 38. Wind erosion can be controlled if the land is used right and managed carefully.

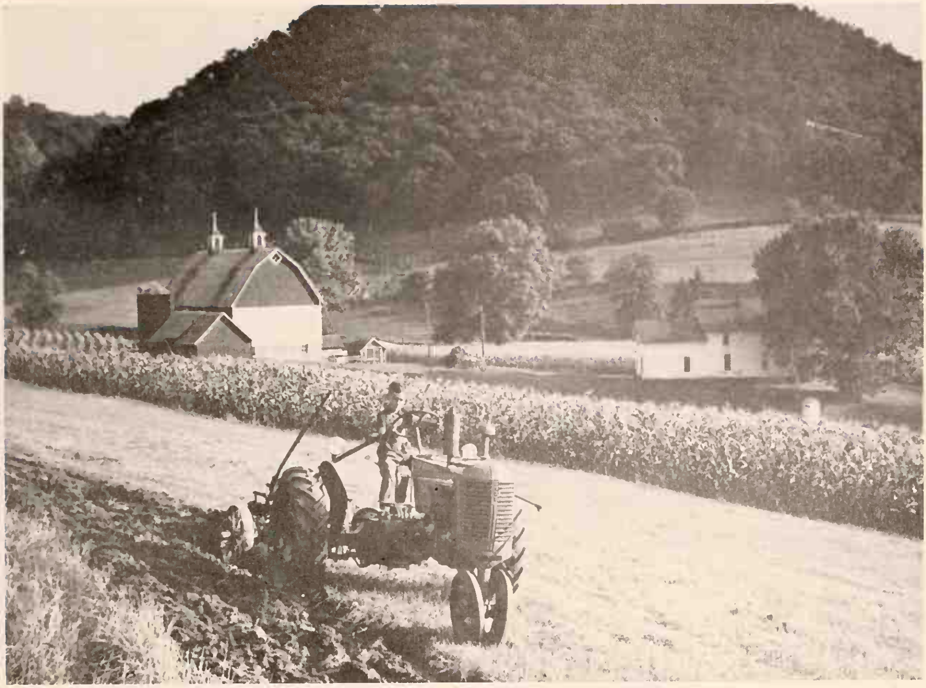

IT TAKES A BARREL of WATER-
to RAISE A STALK and EAR of CORN

KEEP THE WATER ON THE LAND

WE HAVE SEEN what happens to the soil when water runs off the land instead of soaking into the ground. Another reason why it is bad for the rain to run off the land is that plants need water to grow. It takes a barrel of water to raise just one stalk and ear of corn. Do you remember how much water is needed for a bushel of corn, a bushel of wheat, or a pound of beef? (If you turn back to page 7 you will find the answers.)

Although there seems to be plenty of water for everything, it is not always where it is needed. Plants can use only the water that is within reach of their roots. If the water runs off the land quickly, it is out of reach of the plants. It is usually best to try to keep most of the water on the land where it falls. It then stays within reach of the plants or seeps down to underground storage.

This underground storage water is also very important. Well water for cities and towns comes from this source. The underground water also feeds the streams and prevents them from drying up during dry weather.



USE THE LAND RIGHT

FINDING THE RIGHT USE for the land is the first step in saving soil and water. The soil conservationist helps farmers do this. He grades the land on the basis of two things: (1) The danger of hurting the land by farming it, and (2) the amount of care needed to keep it good. With this information the farmers decide whether the land can best be used for crops like corn, cotton, and wheat, or whether it should be kept in grass and trees.

There are many things to look for in deciding the best use for an area of land. The depth of the topsoil is one of the most important. Other things such as color and wetness or dryness of the soil, steepness of slope, and even the climate must be considered.

This picture shows land being used according to the way it is formed by Nature. The hill in the background is covered with trees. It is too steep and the soil is too shallow for cultivated crops or even grass. Trees are a safe use. The land just below the trees is suited to grass. Where the boy is sitting on his father's tractor the soil is deep, and the land is not too steep to be cultivated.

GRASS HOLDS THE SOIL

NATURE PROTECTS soil with growing plants. Some of the best of these plants are the grasses. A large part of our country was covered with grass when the white man first saw it.

Grass grows in a thick mat called sod. When roots of grass die, they decay and form humus. This makes the soil black and rich. Before our country was settled, this process had been going on for thousands of years. That is why the soils of Illinois, Iowa, Kansas, Nebraska, North and South Dakota, and the other prairie states are so fertile.

Blades of grass grow so close together that they break the force of the raindrops as they fall. Then the rain does not pack and harden the soil. The blades of grass also serve as tiny dams to slow down the water which runs off. The roots are very fine, and they lace together to keep the soil from washing away. For all these reasons, grass sod acts like a sponge and soaks up much of the rain water. In one test eight times as much rain water ran off the corn plots as off the grass plots. If water doesn't run off a field, it cannot cause the soil to wash away.

Steep land should be left in grass or trees because you can't plow and cultivate a steep slope and still keep the soil from washing away. Grass is good feed for cows and sheep because these animals can digest such bulky feed. Hogs and poultry also eat grass, though in smaller amounts. Farmers who grow grass to keep their soil from washing away can use the grass as pasture.

TREES PROTECT THE LAND

BEFORE THE WHITE PEOPLE came to America, trees grew on much of the land. Trees protect the land from washing in much the same way that grass does. Tree leaves break the force of rain drops, and keep the rain from packing the ground. The roots keep the soil porous and let the water soak in.

Scattered on the ground beneath the trees you can see leaves, twigs, and other bits of dead plants. These remains are gradually rotting and becoming mixed with the topsoil. They finally become a part of the soil itself, and help to make it rich.

Farmers can grow trees on land too steep for plowing. Of course, trees will grow on good land too, but most farmers use their best land for crops.

The farmer should take care of his trees just as he does any other crop. He can harvest the trees when they are large enough. The wood from trees is needed to build houses and furniture and to make many other things people use. Some wood is also used for fuel. The farmer should cut only the trees that are big enough and leave the others to grow.

The worst enemies of trees are insects, disease, fire, and farm animals. They kill the young trees and often kill or damage the larger ones. Insects and diseases may be hard to control. But we can be careful about starting fires, and we can keep livestock out of the woods. There is not much pasture in a good woodland anyway.

Corn

Small Grain

Hay

A CHANGE OF CROPS HELPS TO KEEP SOIL HEALTHY

ONE WAY in which a farmer can prevent erosion and keep his soil fertile is to use crop rotations. Crop rotation means growing different crops on the same field from year to year in the same order. For example, he might grow a row crop like corn the first year, a small grain like wheat the second year, and hay or pasture the third year. Since three years are needed to complete this rotation, we call it a three-year rotation.

The fourth year the farmer would start all over again. By having his fields of about the same size, he can grow about the same amount of each crop each year.

Growing crops in rotation is helpful in several ways. For one thing yields are always higher. The hay crop usually improves the soil, and there is less erosion on the hay land than on the other cropland. Tests also show that less soil washes from a cornfield if the corn is planted after a hay crop than if it is planted after another corn crop. There are many other advantages to using crop rotations that you may want to study.

Rotations vary in length from two years to six or seven years or even longer. They also vary in the kind of crops that are used. It is a good idea, however, always to use a mixture of grass and legumes for the hay crop. The rotation the farmer uses will depend on the kind of land he has, the crops he grows, and the kind of livestock he raises.

EXTRA WATER MAY HAVE TO BE REMOVED

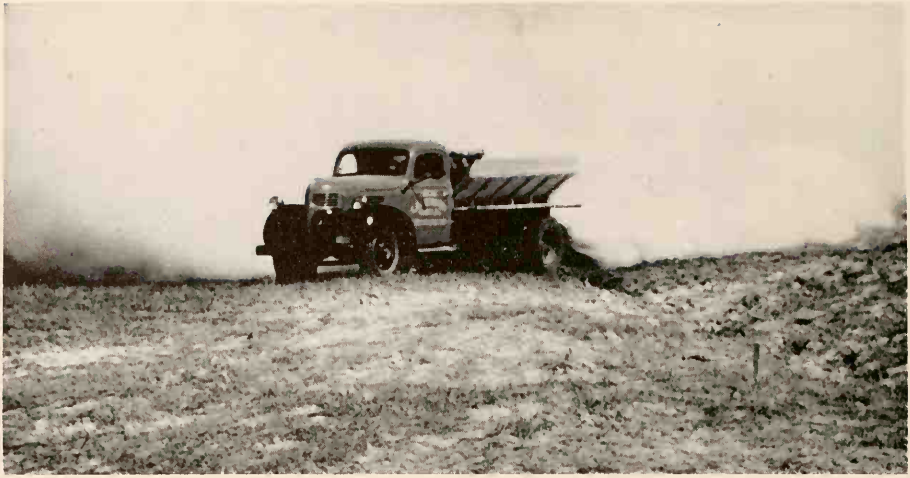
SOME LAND is naturally too wet (like that on the left, above) though it is otherwise good for growing crops. The farmer can get the extra water off these wet soils by draining the land.

Draining wet land is good business for the farmer. Wet land is usually flat and therefore does not wash away. If it can be drained, it will add to our supply of cropland that is not in danger from erosion. Every acre of wet land that is drained and used for crops means that another acre of steep land can be planted to trees or grass to protect it from washing. Draining wet soil also means more food and other products from the land.

There are several ways to drain wet land. One way is to make an open ditch across the field. The water drains out of the soil into the ditch and then runs off. Sometimes several ditches are needed to drain one field.

Another way is to lay short pieces of tile end to end in the ditch and cover them with soil. The extra water seeps through the openings between the sections of tile and is then carried off the field.

Some land should not be drained at all because the soil will not be good for crops even after it is drained. It is best to leave land like this for the birds and animals to use as a refuge.



GETTING BREAD FROM STONES

THE SOILS on our farms are largely ground rock. Mixed with the rock materials are the decaying remains of plant and animal life. We call these remains organic matter or humus. Plants take from the soil the nitrogen, minerals, and other plant food they need in order to produce the crops we live on.

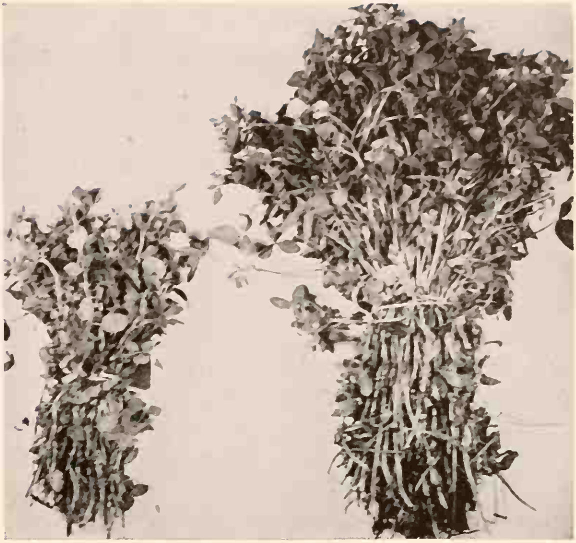
One of the most important of the rock materials in our soil is limestone. From it comes a mineral called calcium, which plants need to grow well. Limestone also keeps the soil "sweet." Most common field crops do best when they are grown on a sweet soil. This is especially true of clovers. In fact, some clovers will not grow at all on a sour or acid soil.

Soils get sour because some limestone is removed by crops and some is carried away in drainage water. Soils in the East and South and in much of the Middle West are commonly sour and need liming. Most soils in the dryer western states and some soils in the Middle West, however, do not need limestone. In the South it is easy to put on too much lime. The safe thing to do before liming is to find out just how much limestone, if any, to apply.

Fortunately we have tests that tell us when a soil is sour and how much lime is needed. The most common one is made with an electric tester. Other tests are made with chemicals. The important thing is to use the test best adapted to your soils and then treat the soil according to the results. The picture shows a field that has been tested and is being limed.

Clover on left grew on soil which was low in phosphorus and to which no phosphate had been added. Clover on right grew on the same land, but phosphorus had been added to the soil.

Treating the soil with phosphorus tripled the yield of clover and doubled the amount of phosphorus in the clover. Animals thrive best on hay containing plenty of phosphorus.



THE FOOD FACTORY MUST HAVE RAW MATERIAL

ON A TRIP you often ride through parts of the country where the land looks much the same. Yet in one field you see fine crops growing, and in another the crops are not so good. What makes the difference?

This picture tells part of the story. It shows how important it is to have plenty of phosphorus in the soil. Plants need not only phosphorus, but also other minerals, nitrogen, and water. All these things they take from the soil and carry up into the leaves. There, with the help of the sun, these materials are combined with carbon dioxide from the air to form protein, starch, and sugar in the growing crops. That is why the farm can be called a food factory.

Where you see crops doing well, you can be sure the farmer is doing his part to keep his factory running at top speed. He uses land that is suited to crops. He plows down clovers, grasses, manure, and remains of crops; and puts on fertilizers as needed, using soil tests to tell what to put on. He sees that excess water is carried away without causing the soil to erode; yet he tries to keep enough water in the soil to tide his crops over a dry spell. Where you see poor crops, you may be sure the farmer is not doing some of the things he should do to make his crops grow well.

Next time you go driving, see if you can pick out the food factories that are running at full blast and those that are partly idle.

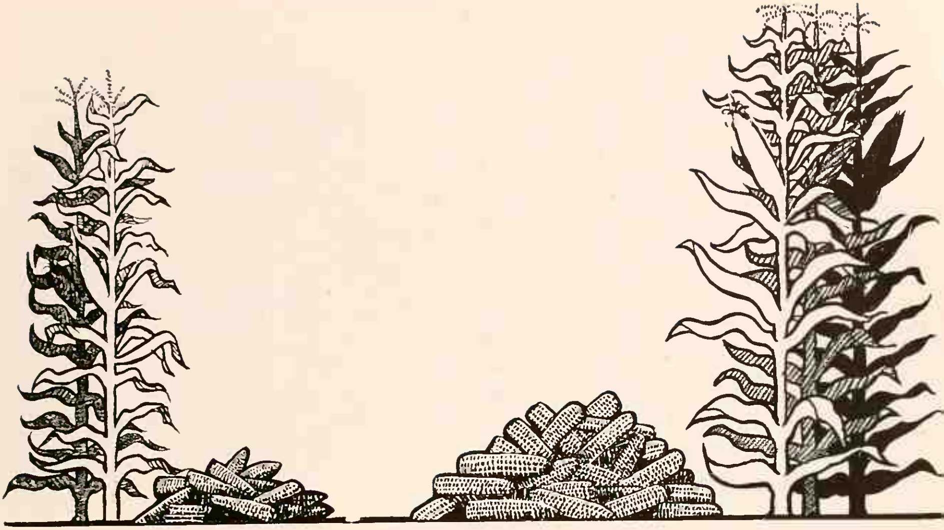
CLOVER PUTS LIFE INTO THE SOIL

DO YOU ever wonder why some soils are light in color and others are dark—often almost black? The color is determined by the amount of organic matter (decaying remains of plant and animal life) in the soil. Generally, the darker the soil, the more organic matter it has. Organic matter is the storehouse for nitrogen, which makes plants grow big and fast. In fact, without it they cannot grow at all. The organic matter also holds supplies of other needed plant food.

Organic matter soaks up water like a sponge and holds it for plants to use in dry weather. Yet soils rich in organic matter drain better in wet times than soil that lacks organic matter. They are also easier to work. You can see then, that soil should have plenty of organic matter.

Crops use up a part of the organic matter in the soil each year. To keep the soil healthy, we must keep putting back organic matter. The farmer in this picture is plowing under a good crop of sweet clover that will add a lot of fresh organic matter to his soil. We call this a green manure crop. Clovers are fine crops for this purpose. They take nitrogen from the air and make it into plant food. Little bumps (nodules) on the roots are the home of the bacteria which help the clover plant store the nitrogen. Grasses cannot take nitrogen from the air, but they do add organic matter to the soil. Clovers and grasses are often grown together for green manure.

Organic matter also comes from crop residues (stalks and straw) and animal manures. All these things should be put back into the soil.



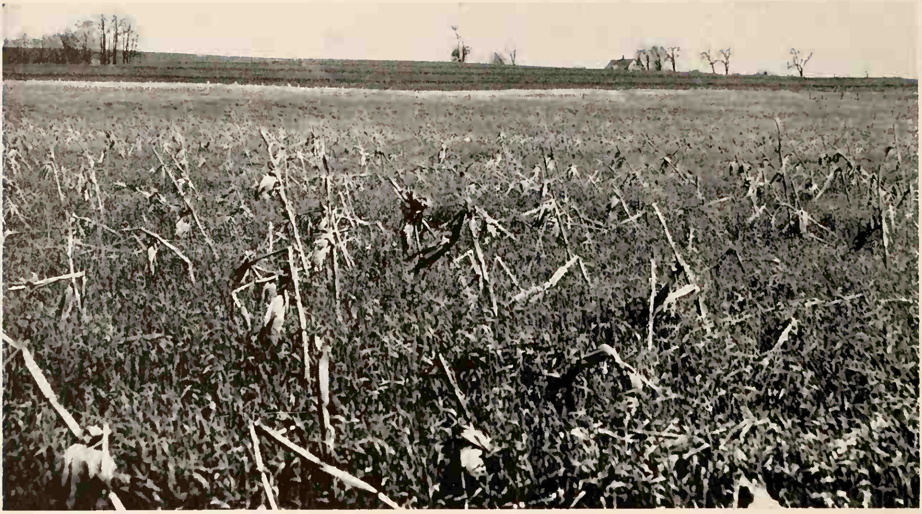
IS YOUR FOOD COUNTERFEIT?

HAVE YOU ever seen a counterfeit coin? If you have you know it looks much like a real coin. But a chemist's test will show that it contains less silver or other precious metal, and is worth much less. Food raised on poor soil can be counterfeit too. It may look good, but tests will show that it has in it too little of the things we need to keep healthy.

The Elizabethtown soil experiment field in southeastern Illinois is on eroded land. Since the field was started in 1917, water has carried much of the soil away. Part of the field has had no treatment, while part has received limestone, phosphorus, and potassium with clover plowed down. The part getting no treatment has suffered the most.

In 1947 corn grown on the untreated land had only two-thirds as much protein as that grown on the treated land. It was counterfeit food. Also, the yield on the untreated soil was only 23 bushels an acre (above, left). The treated part yielded 46 bushels (above, right).

The Morrow Plots at the University of Illinois are on good prairie soil. One plot has produced corn each year since 1876 without any soil treatment. Another plot has been in a rotation of corn, oats, and clover. Since 1904 this plot has received a treatment of lime, phosphate, and manure. In 1949 the continuous-corn plot yielded 20 bushels an acre. The treated corn-oats-clover plot yielded 104 bushels, and each bushel of this corn contained a third more protein than the corn from the untreated plot.



THE SOIL NEEDS WINTER COVER

WHEN A CULTIVATED CROP like corn is harvested, the land is left bare, except for the dead stalks. If kept on the land, these provide some protection against fall, winter, and spring rains, but not enough. A lot of washing takes place during these seasons, as well as during the summer. A crop growing on the land during the fall, winter and spring will help a great deal to keep the soil from washing away.

This picture shows wheat which the farmer planted in his cornfield late in the summer. When the corn was harvested, the wheat covered the ground and kept it from washing.

Wheat is a winter crop that is planted in the fall and matures early the following summer. Rye and winter barley are crops like wheat. They all grow close together and cover the ground like grass. Because they do not need to be cultivated, they protect the land against erosion better than row crops like corn.

These crops make good pasture for livestock during the fall, winter, and spring. They may also be harvested for grain, or the farmer may plow them under to add organic matter to his soil.

Other crops, such as rye grass, crimson clover, wild winter peas, bur clover and vetch, are used in different parts of the country for winter cover. Of course, all the grasses and legumes are good winter cover for the fields on which they are growing.

BURNING STALKS AND STRAW IS WASTEFUL

SOME PEOPLE think that it's easier to burn stalks, straw, and other crop remains than to work them into the soil. In this picture a farmer is getting rid of his cornstalks by burning them.

But there are many reasons why we should not burn material of this kind. First, notice the heat or energy that is being wasted here. This energy came from the sun and was stored in the plant when it was green and growing. Now it is lost and we can't get it back.

If these cornstalks had been plowed under, they would have fed millions of helpful bacteria. Bacteria are small organisms in the soil. They would have caused the stalks to decay and form humus or organic matter, which is a very valuable part of the soil. Organic matter helps the soil to hold more water, makes it easier to work, and makes it produce more crops.

These crop remains could have helped to prevent erosion if they had been left on the land, for they would have slowed the flow of water. Stalks, straw, and leaves protect the soil from beating rain and from wind. Page 38 tells you about a special way of using crop remains for this purpose.

Some people burn the woods to kill the weeds and make the grass grow, but that does more harm than good. The fire kills the young trees and hurts the large trees too.

PASTURE HOLDS THE SOIL AND MAKES MONEY TOO

WHEN MANAGED properly, grass on the land will prevent erosion. If farmers are going to grow grass, however, they must earn some money from it. They do this by raising cattle, sheep, or other animals that eat the grass. Then the farmers sell the animals or the milk, butter or wool.

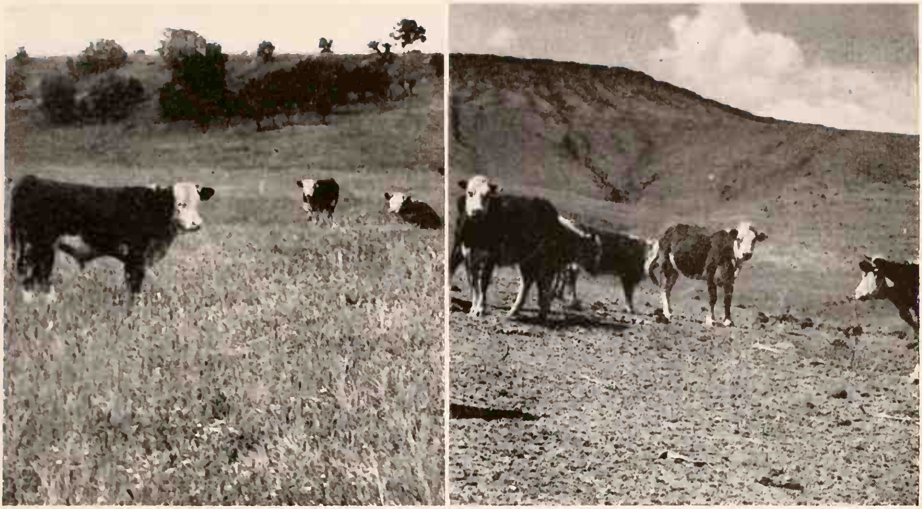
Grass grows best with a legume like clover or alfalfa. The legume takes nitrogen from the air and this helps the grass to grow. The grass helps the legume by keeping the soil bound together so that it can't wash away.

Grass and legumes mixed make better feed for livestock than do either alone. The nitrogen in the legumes form protein, which makes animals grow. Good grass is fattening. It also helps to keep animals from bloating, as they often do when they eat too many legumes alone.

The farmer can have either permanent or rotation pasture. Permanent pastures are left in grass or grass and legumes all the time. They are usually put on land that is not good for growing cultivated crops. Rotation pasture is grown on cropland that is used for grazing for a year or more and is then planted to a cultivated crop. Corn or another cultivated crop may be grown one year, then a crop of oats or wheat, followed by a pasture mixture like bromegrass and alfalfa. This may be pastured three years, making a total of five years in the rotation. The farmer would need five fields so that he would have a row crop every year.

Pastures, both rotation and permanent, need good soil the same as other crops. Pastureland should be treated with limestone, phosphate, and other fertilizers as needed.

More of our land should be in pasture to protect it from erosion. If well used the pasture would give the farmers as much income as other crops.



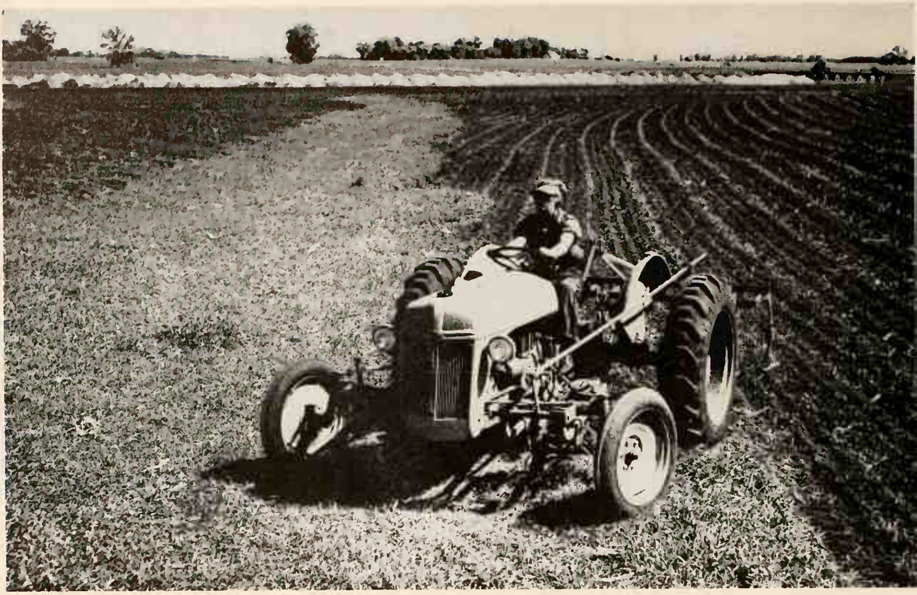
GOOD RANGE GRASS—GOOD CATTLE; POOR GRASS—EROSION

WHEN the grass on western ranges is grazed too closely year after year most of the grass is killed. The small amount of grass left cannot protect the land against the rain. The water runs off, carrying away soil and cutting gullies as shown in the background of the picture on the right. Then the land can no longer support cattle. It will take years of good management or reseeding or both to restore good grass on this range.

The wisely used range on the left grows plenty of grass for the cattle. The wise rancher lets his cattle eat only a part of the grass plants. This keeps the grass healthy and it can keep on growing year after year. With good management like this, the land can support more cattle, and there will still be plenty of the grass stems and lower parts of the leaves left to start a new growth the next year.

These uneaten parts of the grass plants fall down to form a cover called litter. With the remaining grass clumps this litter protects the surface of the soil from hard rains. Instead of rushing down the slopes much of the water sinks into the ground. Part of it is used by the grass and part of it seeps deeper into the soil to form springs and streams. This stream flow in the West is used for irrigating farm crops in the valleys.

Ranchers who care for the range wisely produce more meat and make more money. And by doing so they help save precious water for other crops.



GRASS WATERWAYS KEEP GULLIES FROM FORMING

WHEN WE HAVE heavy rains, the soil cannot soak up all the water. Some of it must run off. On sloping land this water gathers in the channels in the lower parts of the field. We saw on page 10 what happens if these channels are left bare. Grass does a good job of holding the soil. Therefore, good farmers protect these waterways by seeding them to grass.

Look at this picture and you will see what we call a grass waterway. It is a broad saucer-shaped channel covered with a thick stand of grass. By keeping gullies from forming, grass waterways on many fields protect the valuable tile lines laid underneath. They also serve as outlets for terraces. In fact, grass waterways are one of the most generally needed measures against soil erosion.

The farmer must take care of his waterways and keep them in repair just as he does his tractor. When he crosses a waterway with a plow or other implement, he must take care not to dig it up. He must also keep cows and pigs off the waterway, especially when the ground is wet. He can harvest the grass and make hay from it to feed his animals. The waterway is also a good place for birds to build their nests and for rabbits to hide.

PLANTING CROPS ON THE CONTOUR SAVES SOIL

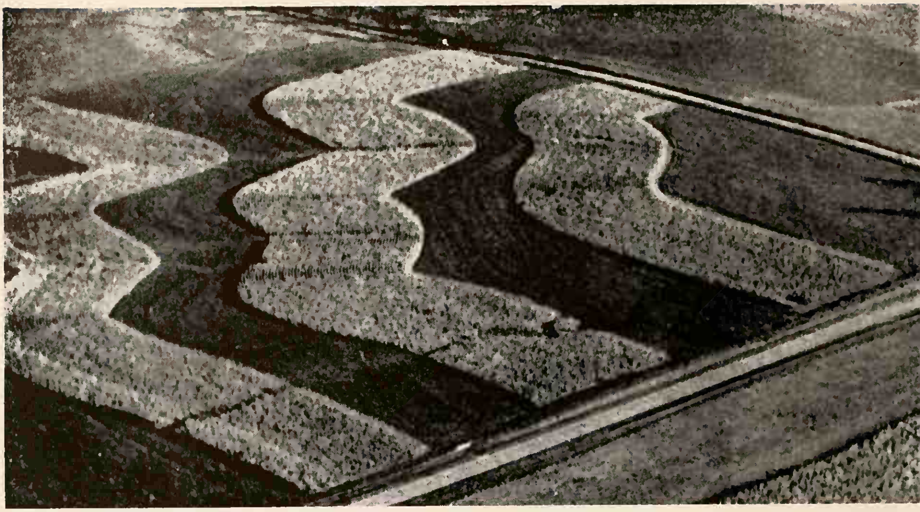
ONE OF THE EASIEST THINGS a farmer can do to keep soil from washing is to plant his crops on the contour. That is, he plants the rows on the level around the hill or across the slope, instead of up and down the hill. Each row acts as a barrier to stop the flow of water down the hill.

When rows are planted up and down hill, they let the water run off quickly. Since it doesn't soak into the ground, it is not stored for use during a dry period. And of course, when it runs off swiftly, it carries away soil. On gentle slopes contouring reduces erosion about half.

Farmers have found that they get higher yields of corn and other row crops by planting on the contour. One reason is that more water is saved for the plants to use. Another reason is that plant foods are not washed away and so the plants get more food to make them grow.

There are other advantages to contour farming. It takes less power for the tractor to run on level ground than up and down hill. Machinery lasts longer too. The farmer can also save time, because the rows are longer and he does not waste so much time turning around at the ends of the field.

All row crops on sloping lands should be planted on the contour. Contour farming alone will not control erosion, but when contouring is combined with a good crop rotation and grass waterways, it will do a lot to keep the good soil on the land.



STRIP CROPPING SLOWS SOIL LOSS

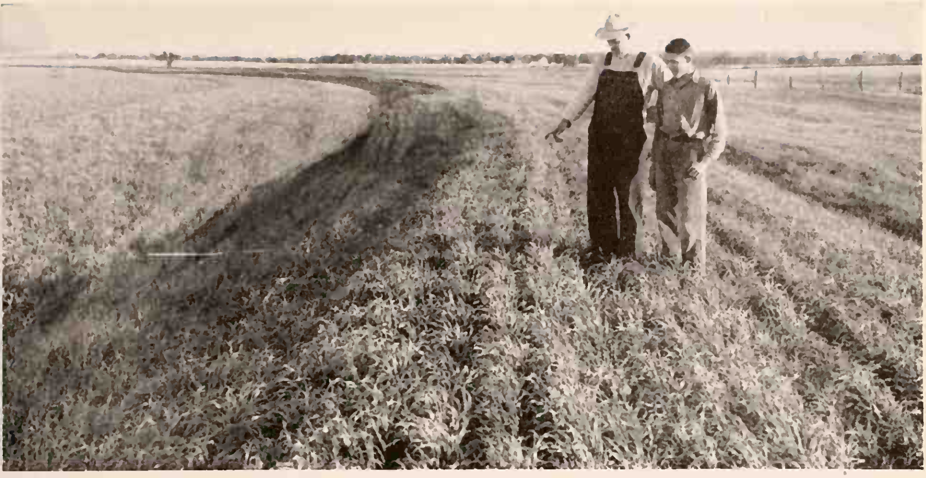
FARMING ON THE CONTOUR will do more to keep the soil from washing if the crops are planted in strips with grass-legume meadow in between. This is called strip cropping. If the slope is very steep, there will still be some runoff and some erosion. But the strips of close-growing crops will help slow down the water and keep the land from washing.

The water may wash a little soil from the corn strips but when it flows into the meadow strip below it, it will slow down and drop the soil it is carrying. Some of the water may soak into the ground too, and there will be less water to flow into the next corn strip.

The strips are changed every year. Corn may be planted where the meadow was the year before. A small grain like wheat or oats may be planted where the corn was, and a meadow strip may follow the small grain. Meadow strips help the soil to rest and make it richer.

In strip cropping, as in contour farming, the farmer needs to leave grass waterways to keep the water from forming gullies (page 30).

Strip cropping will not control erosion completely. The farmer must also use a good crop rotation and soil treatment. And even then on long or fairly steep slopes, he may need to add terraces. Terraces do even more than contouring and strip cropping to keep the water from washing the good soil down the hill. But strip cropping does help to save the soil, and many farmers are using it successfully.



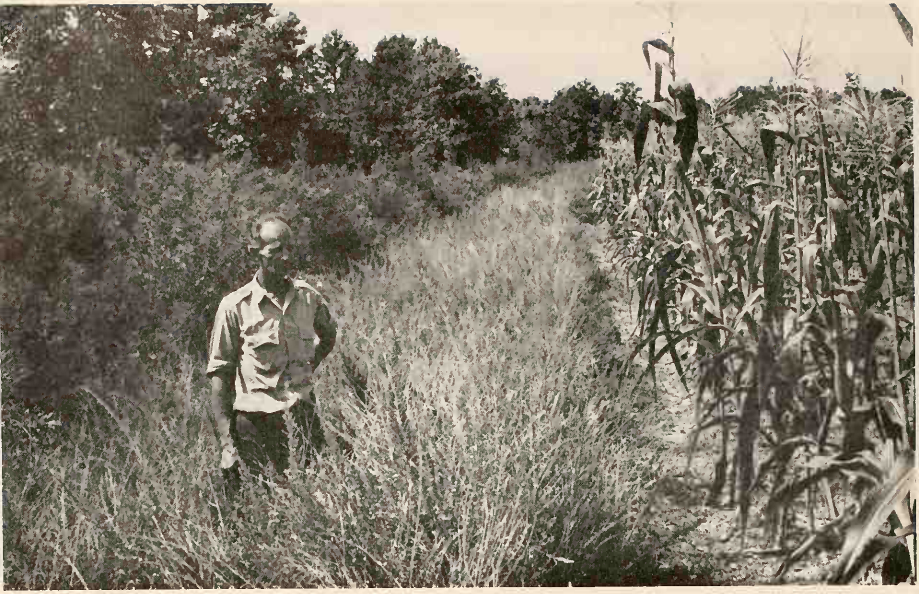
TERRACES MAKE RUNNING WATER WALK

THIS FARMER and his son are standing on a terrace. A terrace is made by moving soil downhill and piling it to form a low, rounded ridge across the slope. The ground is a foot or so lower on the uphill side of the terrace, so that there is a channel between the terrace and the hill. When it rains so hard that part of the water starts down the hill, it stops at the terrace and collects in the channel. Then it flows slowly off the field by following the terrace around the hill to a grass waterway. The farmer builds the terrace so that the channel will have a little slope which makes the water flow toward the outlet. Farmers can build terraces with their regular machinery, such as plows and disks. Or they can use heavy road-building machinery or special terracing equipment.

Notice that a crop is growing both in the channel and on the ridge. None of the land is wasted. This is an important point for the farmer to watch when building a terrace. If he builds his terrace wide and makes the slopes very gentle, he can farm over it with all his equipment.

Terraces must be high enough, wide enough, and close enough together to make the extra water stay in the channels, even in the hardest rains. They must do this to be worth while because it is the hard rains that cause most of the damage. If the water flows over one terrace, it will cause all the terraces below it to fail.

Although terraces are one of the best measures we have for controlling erosion, they will not do the job alone. They should be used only along with crop rotation and other good soil practices.



FIELD BORDERS OF GRASS AND LEGUME SAVE SOIL

THIS GEORGIA FARMER is standing in a part of the field that is now very useful but at one time was of little value. Along the edge of the corn he has planted sericea lespedeza. Behind that is another valuable plant, bicolor lespedeza, a shrub that furnishes seed for birds.

Before the farmer planted the strip along the edge of the field nothing grew there, and the soil was eroding badly. Water collected at the ends of the crop rows and started trouble. Plowing the strips just made things worse. He found out that the way to handle this problem was to grow something there that was useful and would also protect the land.

These strips along the edges of a field are called turn rows in some parts of the country. In other places they are called headlands, while in others they are known as field borders or border strips.

Sericea lespedeza is used for field borders in the southern states. Brome grass and alfalfa are used in the West and Middle West. Timothy and orchard grass, as well as many other grasses and legumes, may be used.

In addition to controlling erosion the field border is good for the farmer's friends, the birds. It makes a fine nesting place. It also furnishes food. The field border makes farming easier by providing a place to turn around with farm machinery.

ARTIFICIAL RAIN IS SOMETIMES NEEDED

IN MUCH OF OUR NATION the rainfall is either so little or it comes at such irregular times that farmers need to water their crops. This is called irrigation. Most irrigation now is done in the West where rainfall is low. But it is being used more and more during dry periods in the Middle West, East, and South.

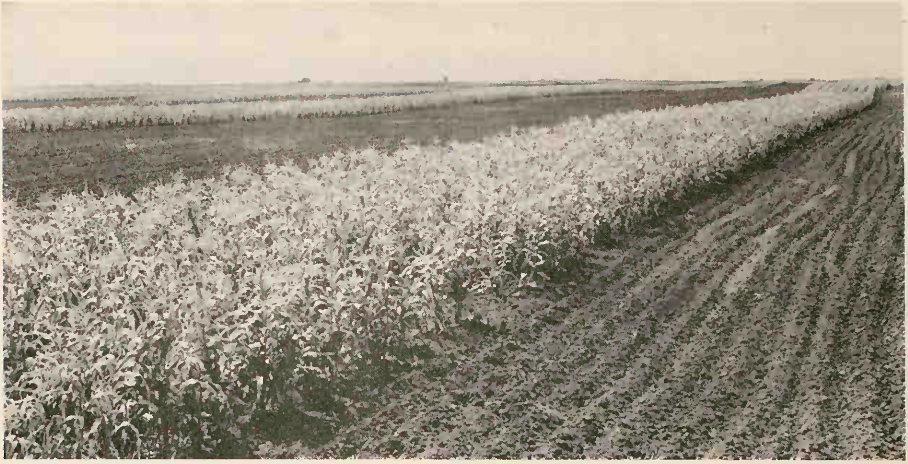
Farmers need plenty of water for irrigation. It usually comes from reservoirs which catch the water from melting snow flowing down from the mountains. Other ways to get irrigation water are to pump it from wells or to build dams on the rivers.

Irrigating may be done either by letting the water flow over the land, or by sprinkling as shown in the picture. Sprinkling is usually best on sloping or on sandy land. That is because there is less danger from erosion on sloping land when sprinklers are used, and sandy soils let water in fast.

Water can be applied more evenly by sprinkling than by flooding. In flooding, the area near the floodgate gets the most water while that farthest away gets little.

It is important to use just the right amount of water. Too much water is wasteful. Not only is water wasted, but plant foods are washed out of the soil. On sloping land too much water causes erosion. On low land too much water may cause the soil to become waterlogged, and then it will not grow some crops.

Farmers are learning by certain tests just when is the right time to irrigate and how much water to use.



STRIPS ACROSS THE WIND SAVE SOIL

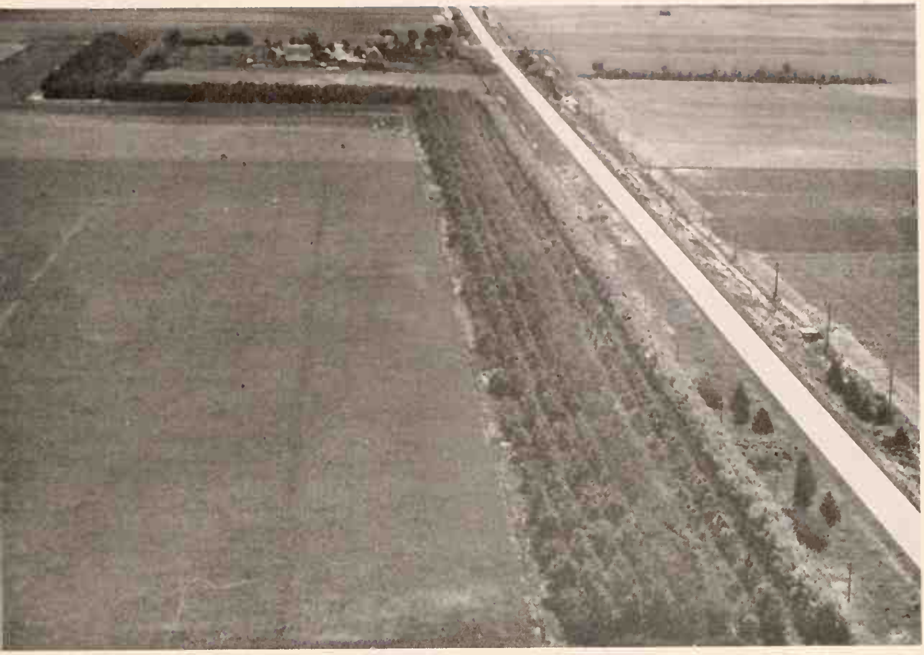
WIND STRIP CROPPING is helping to protect this North Dakota land against wind erosion. Corn has been planted in straight parallel bands crosswise to the prevailing winds. The wind blows across them instead of up and down the rows.

The land between the corn strips has nothing growing on it because it is too dry to produce a crop every year. The farmer cultivates it occasionally to keep down weeds and to make it absorb as much rain as possible. This is called summer-fallowing. The strips of corn cut down the speed of the wind, so that it doesn't pick up as much soil as if it were blowing straight across the field with nothing to slow it down. If any soil is picked up in the plowed strips it is caught in the grain.

In some dry-land farming areas farmers plant wheat on one broad strip one year and let the land next to it lie fallow. The next year the wheat strips are left fallow and the fallow strips are planted to wheat. The wheat strips have to be broader than the corn strips to give the same amount of protection, because wheat doesn't grow so high.

In some areas that aren't quite so dry strips of corn or sorghum are alternated with strips of small spring grains such as wheat. The corn or sorghum protects the land while the small grain is getting started.

Wind strip cropping is useful where rainfall is low, land is level, and soils are sandy. Under these conditions very little water runs off so water erosion is not a serious problem. Of course where the land is sloping the strips can be planted on the contour around the slope. Then they help to prevent water erosion too.



SHELTERBELTS HELP CONTROL WIND EROSION

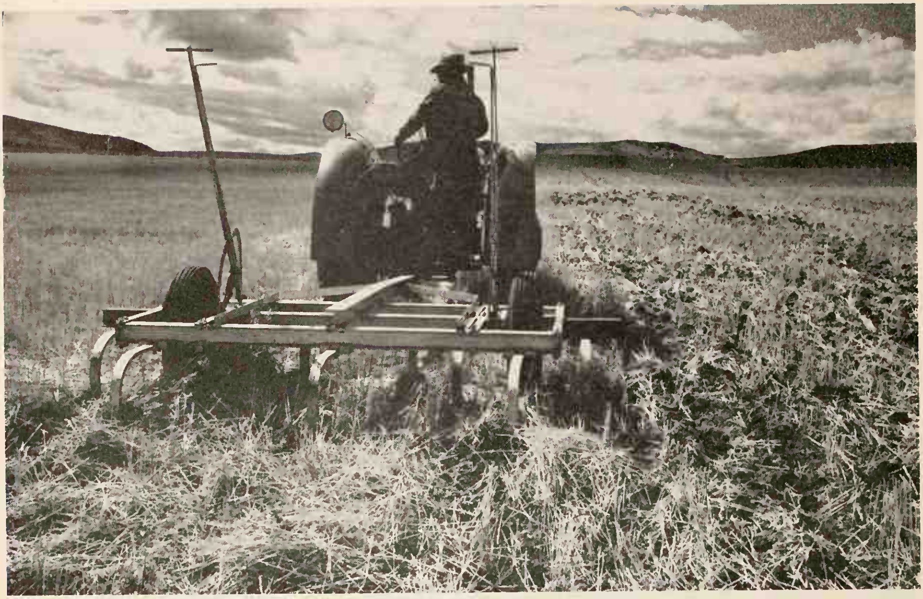
HERE IS AN AIRPLANE VIEW of a shelterbelt in Nebraska. Ten rows of trees make up the shelterbelt. By reducing the speed of the wind, they keep it from drying the soil as much as it would otherwise.

You are looking toward the east. This shelterbelt is protecting the highway and the land to the right of the highway from the north winds. It also protects the farmer's buildings from the north and west winds.

How good a job the trees do in slowing the wind and how much land they protect depends on how high and thick they grow. A good shelterbelt has been found to cut the speed of the wind in half close to the lee side of the trees. At a distance away that is equal to 15 times the height of the trees, the wind speed is reduced by about one-fifth.

Shelterbelts make good places for insect-eating birds. Because the shelterbelts edge so much of the land, the birds are close to the farmers' fields, where they can do the most good.

Either trees that lose their leaves in winter or trees that stay green all year may be used. Perhaps some of each kind make the best shelterbelts.



MULCH FARMING KEEPS SOIL IN PLACE

YOU HAVE NO DOUBT seen orchard men or gardeners use leaves or straw as a mulch around trees, shrubs, or small fruits like strawberries. The mulch lets the rain water trickle gently into the soil where the plants can use it. The surface of the soil is also protected from erosion.

Years ago when our land was all in forest or prairie sod the leaves and grass served as a mulch to keep the soil in place. Since we cut down the trees and broke the sod we have left much of the soil bare. Rain striking this bare surface packs and seals it so that water soaks in slowly and much more must run off. During hard storms raindrops tear the soil loose and runoff water washes it away. In dry weather wind picks up the soil and carries it off.

But now some farmers have learned a new way to keep this from happening. Instead of plowing under stalks, straw, and other crop remains, these farmers leave them as a mulch on or in the surface soil. Because stubble is used along with other parts of the plants, this method is called stubble-mulch farming. The stubble mulch keeps the wind from blowing the soil away. It also keeps rain from packing or eroding the soil.

It takes new tools as well as new methods to make stubble-mulch farming work. So far it has been used most on the Great Plains, where small grain is the main crop. But as we learn more about stubble mulching it promises to become another good practice for saving soil and water everywhere.

FARM PONDS CAN BE USED FOR PROFIT AND PLEASURE

ON MANY FARMS a pond is a good thing to have. Often the farmer builds his pond in a large gully where it helps to stop his soil from washing. A pond holds water that might otherwise run off the farm and damage lower land.

A pond also gives the farmer a good water supply for his animals, for fighting fire or perhaps for irrigating his garden. A pond is a good place to have picnics and to go swimming and fishing. If the pond is cared for properly, it will produce plenty of fish for the farmer and his family to eat. Ponds are also watering places for wild animals and birds.

Taking good care of a pond means fencing it to keep farm animals out. The water can be piped to a tank outside the fence for livestock to drink. Fish do best in a pond where tiny water plants grow fast enough to make plenty of food. Sometimes we fertilize the pond to make these plants grow better. We must also be careful to have the right kinds of fish in the pond.

GOOD SOIL CARE GIVES WILDLIFE FOOD AND SHELTER

HERE IS A NEST of quail eggs. It is in a cemetery. Why do you suppose the mother quail picked this spot for her nest? Because there would be plenty of grass to protect the young birds when they hatch.

Quail are only one kind of wildlife that are valuable on the farm. Other forms of valuable wildlife are song birds, game birds, fur-bearing animals, and fish. Birds help the farmer by eating insects. Animals and fish can add to the farmer's income.

Conservation farming helps wildlife. It gives them food and a place to live. All the laws against hunting and fishing will not increase wildlife if they do not have food and shelter.

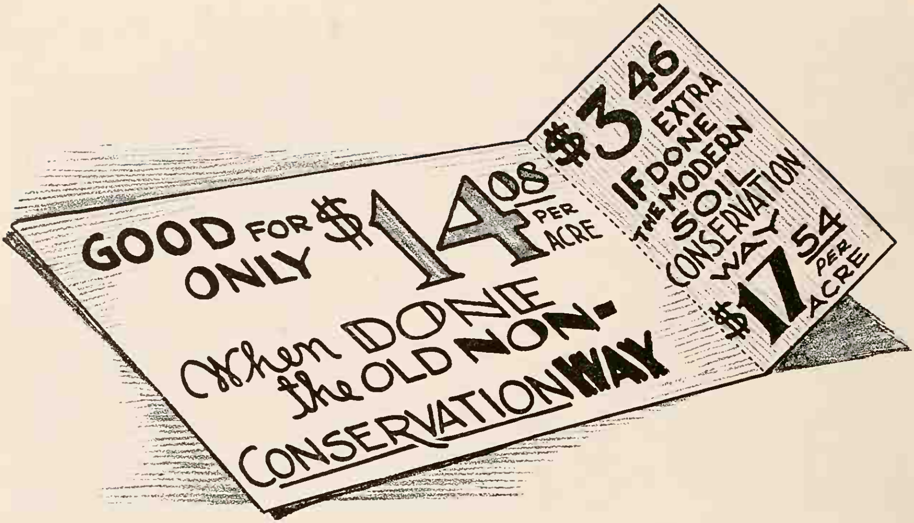
Soil, water, trees, and wildlife all depend on each other and are related to each other. When one is neglected, the others suffer. Therefore, a farmer who takes care of his soil also helps wildlife. If he neglects his soil, there will be less good soil and water and fewer trees on his farm and the wildlife will have to go someplace else to find food and shelter.

LIVING FENCES PROTECT BOTH CROPS AND WILDLIFE

FENCES ARE NEEDED on our farms to keep the livestock in the pasture fields and thus prevent damage to other crops and to woodlands. Farmers have used many kinds of material for fencing. In some states stone fences are common. When timber was plentiful fences built of wooden rails were widely used. Your history book tells you of Lincoln, "the railsplitter." Osage orange hedges were at one time popular on the prairies of the Middle West. And, of course, fences of wire on wood or steel posts are common in many places.

Living fences of a new plant, multiflora rose, are now being used on many farms. Multiflora rose is a thorny plant which came to us from Asia. On good soil it grows not over eight to ten feet high and about the same in width. The plants grow fast and, when set a foot apart in a single row, will make a fence in four to six years. The fence needs no trimming or cutting and does not damage the field crops growing near it. It is beautiful through the entire growing season. The plants bloom for two to three weeks in the spring, and later instead of the flowers you have clusters of bright red berries. A rose fence not only holds the livestock but it provides nesting places and food for the birds and shelter for rabbits and other wild animals.

Multiflora rose does well wherever tea roses can be grown. Find out from a conservationist whether it will grow in your locality. If so you can plant and grow a rose fence around your school yard or on your farm.


GOOD FOR ONLY $14.08 PER ACRE
When DONE the OLD NON-CONSERVATION WAY
$3.46 EXTRA IF DONE THE MODERN SOIL CONSERVATION WAY
$17.54 PER ACRE

THE RIGHT USE OF THE SOIL GIVES MORE INCOME

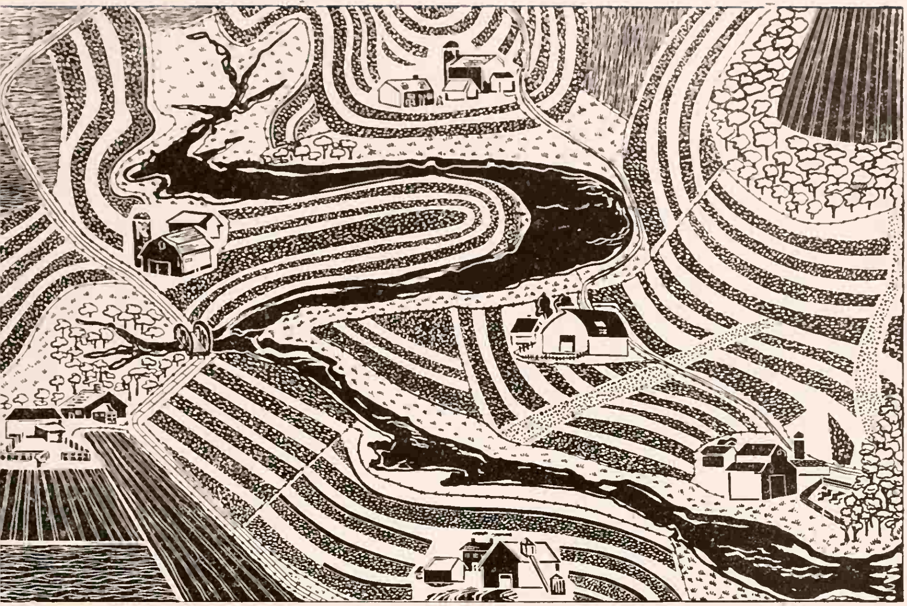
FARMING is a business just like keeping a store or running a garage. A farmer gets his income from the sale of the crops or the livestock raised on his farm. From this income he pays his expenses such as hired labor, gasoline, or feed and seed which he has bought. The money left is his net profit and you can see, of course, that he likes to have this amount as large as possible.

Some farmers have the idea that they can make the most money by farming the land hard, taking everything off and putting nothing back. This is why we have fields that are worn out and badly gullied. But farmers' own account books show that taking good care of the soil pays best.

Over a ten-year period 20 farmers who were doing little to save and build up the soil kept track of their income. This was compared with the incomes of 20 neighbors who were doing a good job of caring for the soil. The picture above shows the results.

The farmers who were not using a good system made a net profit of $14.08 an acre. The other men who did right by the soil made that amount plus $3.46 extra or a total of $17.54 an acre. On a 160-acre farm this means $553 extra income each year—$5,530 in 10 years.

That added income could help pay for the farm. It might be used to put lights and running water in the home, buy a new automobile, or send the children to college. *It pays to save and build up the soil.*



FARMERS IN A WATERSHED NEED TO WORK TOGETHER

HERE IS A PICTURE showing six farms from which the runoff water flows into the same small stream. Land that is drained by one stream is called a watershed. The water flows across fence and property lines from one farm to the other until it gets to the stream.

Almost all farmers live in watersheds like this one. There may be only two or three farmers in the watershed, or there may be 15 or 20. But they all have the same problem. If soil or water moves from one farm onto the next, it can hinder the conservation work on the second farm. One farmer, by refusing to do his part, can make the work of all the others harder.

A farmer in the highest part of the watershed may not keep his soil from washing. The farms in the lowlands will then flood and be covered with silt. Another man may not control the gulley on his farm and it will cut across the line onto the next farm. To keep these things from happening, the farmers all need to work together.

Farmers can help themselves and the land by fitting their conservation work to the watershed. "Farm to fit the land" is a good slogan for farmers to follow.

FARMERS WORK TOGETHER IN SOIL CONSERVATION DISTRICTS

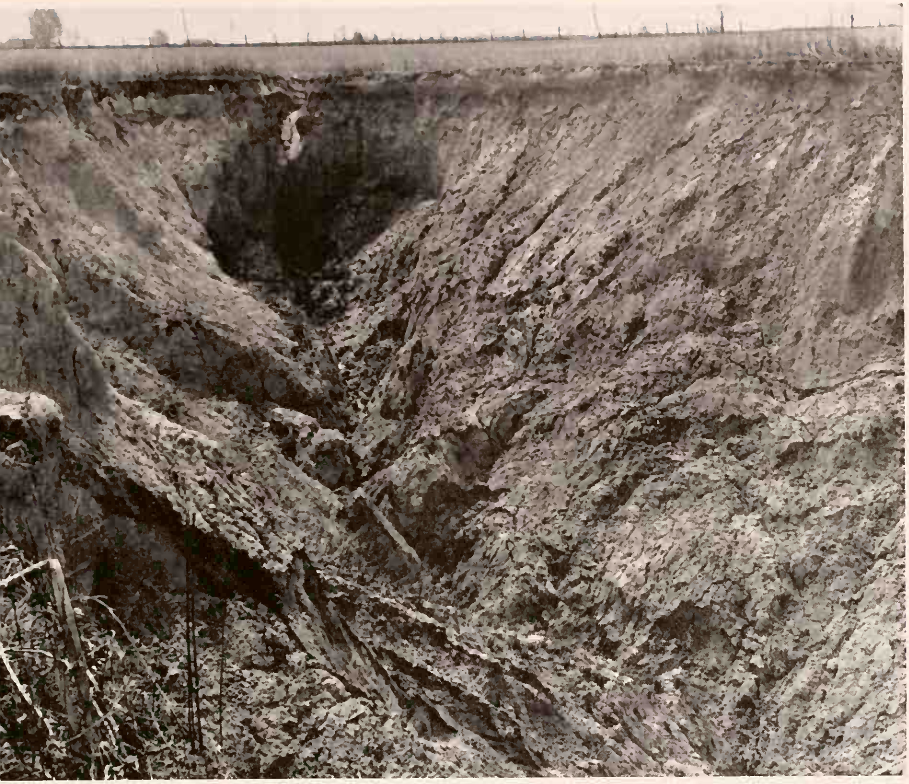
THESE MEN are supervisors of a soil conservation district, holding one of their regular meetings to carry out the business of the district. They are farmers, who have been elected by the other farmers in the district. In some states they are called directors or commissioners.

A district is organized under state law by the people themselves so that they can work together to save the soil. If most of the farmers want a district, they can have it. If they don't want a district, they don't have to have one.

After a district is organized, the farmers elect their supervisors, who plan a program of work that will meet the needs in the district. The supervisors ask other groups, such as the Soil Conservation Service and the Extension Service, for help in carrying out this program. Farmers who want help in saving the soil on their farms go to the supervisors. The supervisors then arrange for the district to work with these farmers.

Most of the farm land in the United States is now in soil conservation districts. It will not be long before all the land will be in districts because farmers want them. They realize that the way to lick a problem like erosion is for everybody to work together. That is what the farmers in soil conservation districts are doing.

If you live in a soil conservation district, why don't you find out who your supervisors are and learn about their work? They are interested in what you and other young people can do to help save the soil.



WHEN LAND IS DESTROYED, WE ALL LOSE

WE AMERICANS are always shocked when a great fire or flood or explosion destroys a lot of property. Sometimes human lives are lost too. But we drive by scenes like the one above and never give them a thought. This land is being destroyed just as much as if there had been a flood or a fire. Not many years ago this was good farm land that produced fine crops of corn, wheat, hay, or pasture. Now, because of bad handling it has been destroyed. It can no longer be used to produce our food. No person lost his life when all this happened. But the food this land could have produced might have kept starving people alive.

In this country we have been wasting our soil. Many times we have worn out one piece of land and then left it and moved on to another. In this way about 100 million acres of once good farm land have been ruined or nearly ruined. Another 100 million acres have been badly damaged. Still another 100 million acres are eroding much too fast. Part of this ruined land may be in your state. Perhaps you can see some of it in your community.

We still have about 460 million acres of good cropland in the United States. With the number of people increasing, we need all of it if we are to have enough food and other farm products to go around. But most of our land is subject to damage from erosion if it is not handled in the right way. Our soil conservationists say that erosion is still taking a half million acres of land every year. All of us, whether we live in the country or in the city should try to do something to stop this damage. We must do all we can to see that the soil on our farms everywhere is farmed "the conservation way."

You may wonder how you can help. To begin with, you can read and observe and learn about soil, what it means to you, and how it can be conserved. This little booklet has given you just a start. If you live on the farm you might want to tell the older folks in your family what you have found out. Maybe you can suggest ways the soil on your farm can be given better care. Even if you live in town you can still talk conservation to the folks you meet. Some of them may own land and be led to manage it better. In any case you will be doing your part to help save your country's soil. Remember, when land is destroyed, we all lose.

These farmers are taking good care of their land by using grass waterways, by planting on the contour and strip cropping, and by treating their soil. Their farms will keep on producing food for a long time.

SOME THINGS YOU CAN DO

THERE ARE MANY simple things you can see or do that will help you learn about soil and water and the need for saving both. Some of them you will do in your class room, your school yard, or at your club meeting. For others you will go out into the nearby fields.

To help you, we have set down a few activities which we believe you will find interesting. From them we hope you can learn some of the lessons of conservation. Your teacher or leader will gladly help you.

1. HOW FAST DO SOILS ABSORB WATER?

You will need 6 large tin grapefruit-juice or tomato-juice cans with both ends neatly cut out; a board 4 inches wide, 1 inch thick, and 12 inches long; carpenter's claw hammer; 12-inch ruler; pocket watch with a second hand; pencils and paper; quart measure; and 2 gallons of water. It will take 2 to 3 hours to complete this exercise.

Avoiding sandy soil, find a spot in each of the following places:

1. An ungrazed and unburned woods where there are dead leaves on the ground, ½ to 1 inch or more in depth.
2. A place in this same woods where there are no leaves on the ground.
3. A spot in a well-used path in this woods where the soil has been packed by walking. (Omit if one can't be found.)
4. A spot in a grazed woods where livestock have packed the soil.
5. A spot in a rotation pasture.
6. A place in a cultivated field where topsoil has all eroded away, leaving subsoil exposed.

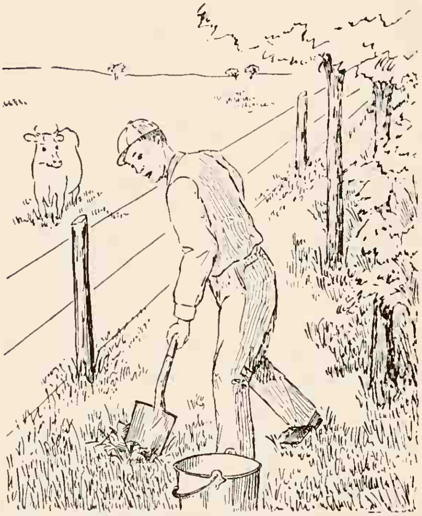
Mark the outside of each can 2 inches from one end. In each of the spots you have selected, set a can so that the end closest to the 2-inch mark is on the ground. Put the board on the can and tap with the hammer until the 2-inch mark is level with the ground. Do not move the soil or any material on top of the soil. Avoid spots where sticks might make it hard to drive the can down. Add 1 quart of water and record the time.

Take notes on the following:

1. Place. (Tell whether the can is in an ungrazed woodland, a path, a rotation pasture, etc.)
2. Condition of the soil.
3. Presence of leaves and sticks.
4. Time when quart of water was added.
5. The amount of water absorbed at the end of each minute for the first 10 minutes. Thereafter, the drop every 10 minutes or every hour, depending on the rate of water absorption. (Measure from the top of the can to the water level.)

Compare the rates of absorption and explain the results. Do the study all in one day, so that at the beginning of the experiment the soils will have, as nearly as possible, the same amount of moisture.

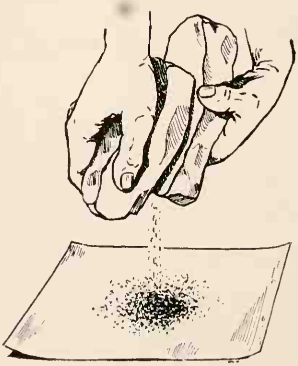
2. IMPORTANCE OF SAVING TOPSOIL



Collect samples of these three kinds of soil: (1) topsoil from an old fence row or from an unplowed pasture; (2) soil from an eroded hillside; and (3) subsoil from a depth of 3 or 4 feet. Put each sample in a flower pot or tin can. Plant seeds in each type of soil and label the containers. Watch the plants grow and keep a record of how fast each one grows and how each looks. From this test how do you think topsoil compares with subsoil for growing plants?

3. HOW SOIL IS FORMED

Take two pieces of limestone or fine sandstone and rub them together. Notice how long it takes to rub off even a small amount of fine material. Soil is made from rock when the action of wind, rain, glaciers, and other natural processes causes small particles to break off from the rock. This is called *weathering*. It takes a long time for weathering to make soil from rocks. Later we shall see that we are letting our soil get away at a much faster rate than nature can build it up.



Another kind of weathering may be shown in the winter: Fill a glass jar with water and cap it tightly. Then put it outdoors and let it freeze. When the water has frozen solid, the jar will burst. In the same way freezing can burst rocks and cause tiny particles to be broken off to help form soil.

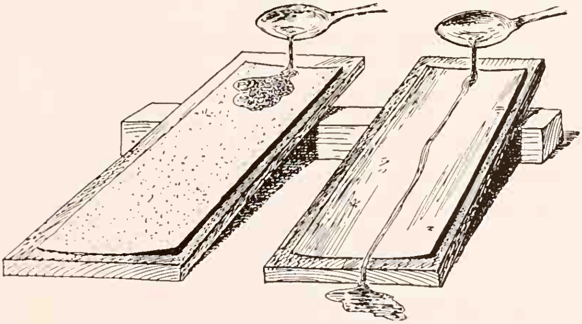
4. SILT CARRIED BY WATER

You will need three quart mason jars with lids and rubbers for this study. After a good spring rain, visit a small stream that gets at least a part of its water from cultivated land. Fill one of the jars here. Then find a stream where all the water comes from woodland and one where the water comes from good pasture or meadow. Get a sample from these streams. Allow all three of these samples to settle for a few days. Which water sample held the most soil? What is the reason for this difference?

5. HOW ORGANIC MATTER HELPS SOIL HOLD WATER

Go out during or after a rain that follows a dry period and see what happened to the water. If a spade is handy, dig down and see where the water has soaked in the deepest: (1) on bare soil, (2) where there is grass or forest, (3) on a hillside, or (4) on soil in any other condition you find.

6. EFFECT OF CROP COVER ON LOSS OF WATER



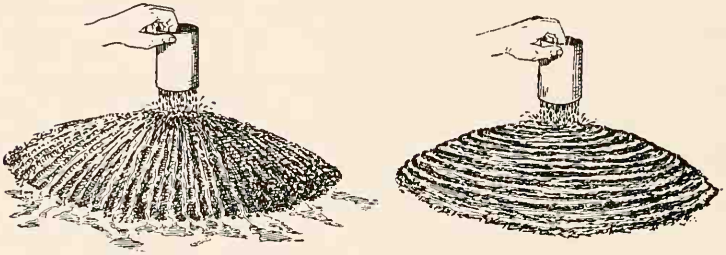
Place a piece of blotting paper and a piece of slick cardboard at a sloping angle. Using a small spoon, pour a little water on each. Can you compare this with two sloping fields—one covered with grass or trees and the other bare?

7. HOW FIELD BARRIERS HOLD BACK SOIL

Find an old fence, tree, stump, or other barrier toward the bottom of a slope. See how the soil piles up on the upper side and is carried away from the downhill side. What would have happened to the soil if the barrier had not stopped it?

8. HOW CONTOUR FARMING CONTROLS EROSION

Build up two separate mounds of topsoil. With a match, twig, or finger, make furrows running up and down hill on one of the mounds, and on the other make furrows running around the hill (on the contour). Sprinkle lightly the same amount of water on each mound. Check (1) the amount of soil that washed from each mound and (2) the amount of water that runs off each one. Do you see how the furrows running around the hill help to save the water and soil?



9. HOW CROP COVER PREVENTS SOIL WASTE

Using the same mounds of topsoil as in Activity 8, smooth out the furrows on both mounds, cover one with a tiny layer of straw or grass and leave the other one bare. Sprinkle water lightly on each slope and note which one loses more soil and water. The layer of straw or grass shows how a grass or crop cover protects the soil. Do you think it is well to keep the soil covered?

10. OBSERVING HOW SOIL IS DEPOSITED

Find a stream that has overflowed its banks. Visit the stream after the water has gone down and see if any soil has been deposited. If so, where did the added soil come from? How deep is the new deposit of soil?

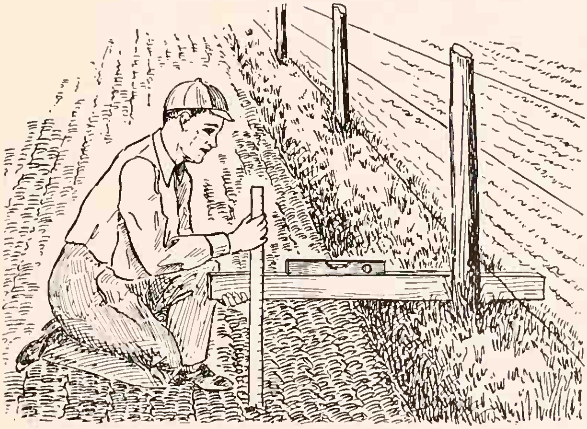
11. MEASURING DEPTH OF SOIL LOSS

Somewhere in the neighborhood find an old fence that was built up and down a slope. Try to find a fence that has been there a long time. Using a spade, dig down and see how deep the dark topsoil is in the old fence row where the soil has not been plowed. Then measure the depth of topsoil in the cultivated part of the field. Compare the two measurements.

How many inches of topsoil have been washed from the cultivated field? If it takes 500 years for nature to make one inch of topsoil, how many years did it take to make the soil that has been lost? Try to find out how long the field has been farmed. How many years did it take for an inch of topsoil to wash away? If the rest of the topsoil washes away at the same rate, how long will it be before it is all gone from this field?

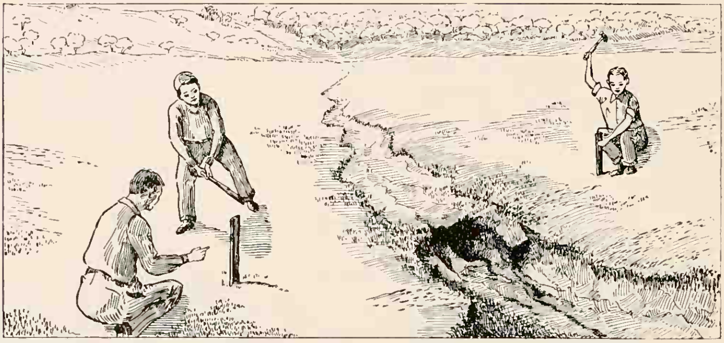
12. ANOTHER WAY OF MEASURING SOIL LOSS

Another way to measure the amount of soil lost through erosion is shown in the picture below. By measuring the difference in height between the old, undisturbed fence row and the soil on each side of it, you can easily see how many inches of soil have been washed away. The farmer on one side of a fence may have taken good care of the soil, while his neighbor on the other side may have neglected it. Notice how the grass on the undisturbed area has held the soil. This is another example of what good land use can do to conserve our soil.



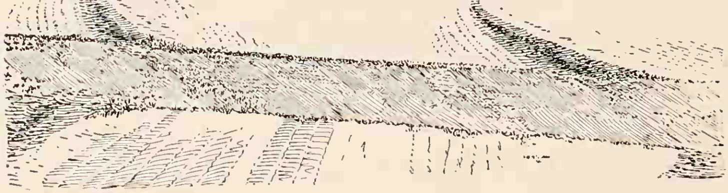
13. MEASURING GROWTH OF GULLIES

Find a gully that is active—one that is cutting deeper with each rain. Go to the head of the gully and drive wooden pegs 10 to 15 feet back from either side of the overfall. After several rains go back and measure to see how far the gully has eaten back since you set the pegs.



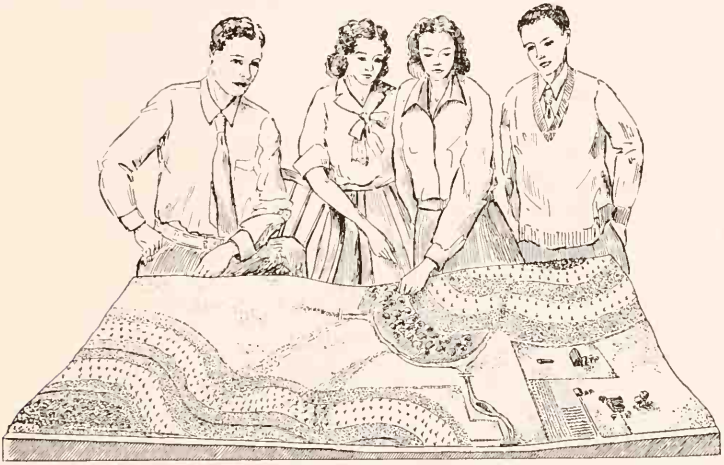
14. SEEING CONSERVATION PRACTICES

Visit farms in the neighborhood where conservation work has been done. Notice such practices as grass waterways, pasture improvement, contouring, strip cropping, terracing and other conservation measures. During art periods, draw pictures of some of these practices you have seen.



15. MAKING A MODEL FARM

Select a small farm in the neighborhood and study it carefully. Make a model of this farm with soil on a table. Mold the soil into hills, valleys, and flat areas. Now plan the use of the farm to conserve soil and water. Put sod on the areas which should be in grass. Pine tree twigs can be used for the woodlands. On the hilly land that is to be cropped, make the rows follow the contour of the slope. Sod the waterways. Use different colored crepe paper or small strips of sod to indicate strip cropping. Show the use of as many conservation practices as possible.



16. MAKING A COLLECTION OF SOILS AND SOIL MATERIALS

You will need five small fruit jars with lids for this test. Fill one jar with black, brown, or red loam. Fill another with clay. In the third jar place sand. Put gravel in the fourth. Fill the last jar with leaf mold. (Leaf mold will usually be found in a woods that has not been grazed. Scrape off the upper layers of leaves until the broken-up, decayed, black leaf mold is uncovered.) Screwing lids on the jars will help to keep the samples moist and prevent spilling. After each jar is filled, label it with the name of the material it contains. Leaf mold is a source of humus or organic matter needed in fertile soils. Other sources are decayed grasses, plant stems, root systems, crop wastes, and manure. Humus helps to keep soils loose and easier to work. It increases the ability of topsoil to absorb and hold moisture for use when the season becomes dry. Soils rich in humus contain more of the foods necessary for good plant growth. Furthermore, soils containing humus do not wash away as easily as do soils without it. Notice the difference in color of the various materials in the five jars. The darker color of loam is due largely to the humus it contains. Compare the particles that make up the soil samples. Test them, except the gravel, by rubbing small amounts of each between the thumb and forefinger. This gives one the "feel" of soils and soil materials and helps in telling the difference between sandy loams and clay loams.

17. GATHERING MATERIALS FOR BULLETIN BOARDS AND SCRAPBOOKS

Cut out from newspapers and magazines any articles or pictures you may find on soil erosion and soil conservation. Also take bulletins and other materials to school.

Keep a well-arranged bulletin board where these items can be posted. Change them often and use them once in a while for class discussions. Later, these materials may be saved in a scrapbook.

18. HOW WATER MOVES THROUGH SOIL AND PLANTS

Put a lump of sugar in a dish which has a little ink in the bottom. The ink will rise in the sugar at once. In the same manner water moves through the soil to furnish plants with some of the moisture they need. This is known as *capillary action.*

To show how water moves upward into the plant roots, place dark cake coloring in a glass of water. Put a small plant into the solution and see how the plant is colored as it takes up the water. This movement of water into the plant is called *osmosis.*

19. HOW MUCH ALIVE IS YOUR SOIL?

Each member of the group should have three large paper bags, a 12-inch ruler, a small hand spade, and six small bottles with lids or corks.

Collect about a gallon of each of the following soils: (1) soil just below the leaves in an ungrazed and unburned woodland; (2) topsoil from a pasture; (3) subsoil from a badly eroded field where subsoil is exposed.

The soil samples may be examined indoors or outdoors. (Indoors is better because the wind will not blow away small specimens.) Place each sample on a separate paper. Carefully sort the dirt and watch closely for small animal life.

Place the different kinds of animal life in separate bottles. Keep a count of the animal life belonging to each of the following groups:

1. Worms (such as earthworms or fishing worms, having no legs).
2. Grubs (any worm-like animal with legs).
3. Snails.
4. Insects (any hard-shelled or winged animal with six legs).
5. Spiders (any animal with eight legs).
6. Others (any animal not falling in one of the above groups).

Which soil sample has the most small animal life? Does this seem to be related in any way to the rate at which these soils absorbed water in Activity No. 1? Does the amount of animal life appear to have any relation to the looseness of the soil?

This activity is best suited to spring.

20. TRACING THE ORIGIN OF THE THINGS WE USE

Discuss where the various things we use come from.

1. Trace clothing back as far as you can see where we get it.
2. Find out where we get such things as the rubber in an eraser, the food you had for breakfast, or the paper you use to write on.

If some one brings out the idea that synthetic rubber is used in place of natural rubber or rayon instead of cotton find out how we get these other products.

21. HOW BIRDS HELP DESTROY INSECTS

Locate a robin's nest, in your back yard, in the park, or on your farm. After you are sure that the eggs have hatched, watch the nest for one hour and count the number of trips the parent birds make to the nest. You can be fairly sure that each trip they make, they are carrying at least one insect of some kind. Often they will carry several at one trip. After completing the count, multiply your result by the number of hours of daylight to determine how many insects this pair of robins destroys in a day.

22. PLANT A TREE

This study is for the spring of the year only and may well be used in connection with an Arbor Day program.

Plan in advance what kinds of trees you are going to plant and where they are needed. Have on hand several tree seedlings or transplants; also grub hoes and long-handled shovels for digging.

Before you do any planting, ask your leader or some other older person to plant a tree, so that you can see how to do it. Try to learn the separate parts of the tree and find out why each step in the planting operation is necessary.

23. HOW MANY USES FOR WOOD DO YOU KNOW?

Materials needed are paper, pencils, and good keen eyesight. Make a list of all the different items made of wood which are used about your home or about your father's farm. This list should include not only the things coming from the woodlands on the farm but also those coming to the farm as manufactured products.

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